APR -8 1919

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLV. No. 2912.] LONDON, MARCH 4, 1919. [71st Year. Price 8d.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C. 2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

TORBAY STOVE BLACK FOR GAS COOKERS.

The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

ECONOMICAL ALUMINIUM LIGHT LASTING EFFICIENT
THE BRITISH ALUMINIUM CO., LTD.,
109, Queen Victoria Street, London.

GAS & CANNEL COAL CONTRACTORS.
WM. F. RUSSELL & SONS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 434).

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia—
JAMES HURLL & CO. LTD., SYDNEY.

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
89, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

GEORGE GLOVER & CO., LTD.,
DRY GAS METER MANUFACTURERS.
Agents for the Patent "M & M" SELF-LOCKING SLOT-METER PADLOCK.

The STRENGTH and SECURITY of the "M & M" Lock depend not upon its EXTERNAL SHAPE, which has been imitated in various quarters, but upon the SPECIAL CONSTRUCTION of its INTERNAL MECHANISM.
The special mechanism, consisting of a sliding bolt fitted with TWO STUMPS and DOUBLE-ACTION LEVERS, is FULLY PATENTED.

See that each lock is stamped **M & M,** *and beware of inferior imitations.*

LONDON:
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, S.W.3.
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, London."

LEEDS:
9, DEWSBURY ROAD.
TELEPHONE: No. 26463.
WIRE: "Meters, Leeds."

MANCHESTER:
GAYTHORN METER WORKS, EASTON STREET.
TELEPHONE: No. 6393 City.
WIRE: "Slot, Manchester."

H. MITCHELL, FOR PATENT SLOT METER PAD & OTHER LOCKS. KENTISH TOWN, N.W. H. J. DENT & CO., LTD., WESTMINSTER, S.W. MANCHESTER. LIVERPOOL. BRITISH MADE

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815.

OLDHAM,

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, Lamb London." Telephone 2412 Hop.

LONDON, S.E. 1.

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

"LEAD WOOL"

Reg. Trade Mark.

PROVIDES BOTTLE-TIGHT JOINTS FOR HIGH OR LOW PRESSURE MAINS.

Is equally suitable for Steel or Cast-Iron Pipes.
Its regular use will reduce unaccounted-for gas.
The cost of the joint being less than with molten lead, capital expenditure is reduced.

Compressors Hired for Testing Mains.
Competent Jointers sent out on reasonable terms.

When mainlaying is proposed, communicate with—

THE LEAD WOOL CO., Ltd., Snodland, KENT.

Tele.: "Strength, Snodland." Tele.: Snodland 661.

The GLENBOIG UNION FIRE-CLAY Co. Ltd.

WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., GLASGOW.

58 FIRST AWARDS At International and Home Exhibitions, including Grand Prize at Brussels, 1910.

In every case the highest awards given for Fire-Clay Goods.

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

DONKIN

for

GAS VALVES

SINGLE AND DOUBLE FACED.

EXHAUSTERS, COMPRESSORS, RATEAU TURBO GAS EXHAUSTERS, PUMPS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, CHESTERFIELD.

LONDON OFFICE: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLV., No. 2912.] TUESDAY, MARCH 4, 1919. [71ST YEAR.

EDITORIAL NOTES.

Gas Wages Award.

THE award of the Arbitrators has been issued in the matter of the application made on behalf of gas workers for an advance of 10s. per week to adults eighteen years of age and over, and 5s. to workers under that age employed on time rates, with proportionate advances in the case of those employed on piece rates. Just one-half of what was claimed has been awarded; and so the labour bill of the industry is to have another enormous addition made to it as from the first full pay day following Feb. 1. For adults, this will mean £1 8s. 6d., *plus* the 12½ p.ct., above pre-war wages. The 5s. a week is a generous allowance, even based upon the Government's own estimate of the increase in the cost of living since the middle of last year. In response to the miners' recent application, it will be remembered that the Government offered 1s. a day as representing the increase in the cost of living since June. In the gas industry the big award was made in April last year; and then in the autumn there was another 3s. 6d. advance, making 23s. 6d. over pre-war rates, *plus* the 12½ p.ct. So that the 10d. a day, or the 5s. a week, having regard to the 3s. 6d. increase in the autumn, is, as we say, generous compared with the Government offer to the miners. Only the other day, the public saw in the Daily Press that it might be anticipated that the cost of provisions would, before many weeks were over, be down the equivalent of 4s. per week. When the rise of 3s. 6d. took place, Mr. Will Thorne estimated that at least 100,000 men in the industry were entitled to the 23s. 6d., *plus* 12½ p.ct. Accepting his figure for computation, the £1 8s. 6d. war time increase is equal to an additional labour cost to the industry for adults only of £7,410,000 per annum. The 12½ p.ct. will probably add between 2 and 3 millions more. And all this without taking into account the wage advances to those who are not eighteen years of age. The full text of the award will be found in a later column.

Benzol and the Co-Operation of Motorists.

A FUNCTION and some excellent speeches are this week the subject of a report in which those in the gas industry responsible for the production of benzol, either directly or indirectly, will be much interested. It was an excellent thought that prompted the Chairman (Mr. D. Milne Watson) and the Committee of the National Benzol Association to inaugurate its work by a luncheon at which there could be a reflection of attitude and a free exchange of opinions between benzol producers and recognized representatives of the mighty body of motorists, upon whose patronage benzol not wholly, but so largely depends. The occasion has given the strongest of encouragement. Reviewing the speeches, one finds in them complete justification for the opinion that the trend of affairs is to bring about a solidly welded co-operative movement between British benzol producers and the British motoring world. The specification which the Association has issued to ensure a standard quality of benzol meets with approval by the motoring organizations. The question of price it is recognized is one that must be subject to producing costs under whatever are the current circumstances; and that, therefore, nothing definite can be said as to it. But it is realized that reasonableness in this respect will prevail on both sides. Motorists know that benzol has in it more running power per gallon than petrol, and that this is worth something. They also appreciate that it is their business to protect home-produced motor fuel, so that they shall not again be left solely dependent upon imported motor spirit. To be protected in this way is also something which contains value for them. They have also experience of the petrol interests. They know right well that, for a period at any rate, these interests, opulent and influential, will probably operate in a manner deliberately directed to the prevention of the expansion of benzol competition. The intervention of the motorists will guarantee the failure of any such strategy.

It is at this point that we find considerable value in the "coming together" there has been between the benzol producers and such a body of potential users as the motorists. When producers and consumers have joint interests, and are determined to act together, then the strongest force cannot compel them to break asunder. It is true that the interests of benzol producers and consumers are not in every respect alike. For the one, there is no use in producing if there is not an absorptive market, and fair profit derivable. The strongest interests of the others are to foster a home supply of what they require, and to keep it out of the hands of those who hold the monopoly of petrol. The position contains inherent factors from the motorists' side that are of an importance well above any desire to simply have one motor fuel to play off against the other in order to achieve lowness of price. This is clear. It supplies the reason why, when Mr. Milne Watson announced that the National Benzol Association Committee had determined to keep the distribution in their hands, and not join forces with petrol importers, the motorists' representatives expressed by applause a hearty concurrence. The motorists recognize that to a large extent this is a concession to their desires, and that the benzol producers are incurring a risk which the motorists have the power to insure them against by giving home-produced motor fuel preferential purchase. For more reasons than one it is a politic move the Association has made; it is one which has in it great possibilities. The Association *per se* has not the machinery to undertake the commercial work of distribution. It has therefore determined to form a Company for the especial purpose. This is an excellent step, the details of which have yet to be settled. Here a good suggestion fell from Mr. E. S. Shrapnell-Smith, which should tighten the bond of interest between producer and consumer. It will be seen from the report that he suggested the capitalization of the distributing Company should be sufficient to allow a part of it to be allocated to motorists both individually and collectively. This would better than anything else ensure a permanence of interest and support. Besides the motoring organizations themselves—as Major Stenson Cooke, the Secretary of the Automobile Association and Motor Union, pointed out—have valuable resources, which would be of use to the distributing Company.

In all this co-operation, there will be mutual gain, which can be carried further. The motorists would pefer a supply of home-produced fuel equal to their demand, so as to have the knowledge that, whatever may befall, their requirements could always be met from internal sources. But that is a balance which is not within sight. The motoring community, however, can do a part, and a considerable part, in assisting in the establishment and expansion of benzol production by gas undertakings. It is recognized by these undertakings that, whatever may be the lines of the recommendations of the Fuel Research Board, as to gas quality and composition, Parliament will have to choose between the arguments of obscurants and the material gains which progress in the manufacturing operations of the gas industry can show, and which progress means the best possible use being made of the coal carbonized, and the placing of the largest quantities of products of various descriptions at the disposal of the community. While gas must remain the prime product of

the industry, Parliament has to be shown that there is a grave responsibility on it for enabling the services of the industry in other directions to be expanded to the utmost consistent with economic stability. It has also to be shown that the internal resources of the country will undergo development by the Government encouraging as far as possible all means which will ensure a progressive transfer of coal from the domestic grate and industrial furnace to gas-works retorts. The motoring community will understand that it is only through greater liberty in respect of the statutory standards of the gas industry, and tapping the sources of crude utilization of coal, that home-produced motor spirit will increase in volume to any considerable extent. The sources of possible expansion are, however, vast if an economical gas for heating can be supplied. We have no doubt that a good majority of members of Parliament are motor owners, and members of one or other of the motoring organizations; and if these organizations will only do their part in educating motorist M.P.'s in these matters, they will be rendering an inestimable service to the making of progress towards the goal which they would all like to see attained—an assured independence of British motorists of fuel from across the seas. Much can be done by co-operation, the seeds of which have been sown.

Mr. Marshall and Low-Temperature Carbonization.

As times and knowledge progress, men are allowed to change their views. If they were not, progress derivable from fresh knowledge would proceed at snail-like pace. The article we published from the pen of Mr. F. D. Marshall in last and this week's issues, on the aims and objectives of low-temperature carbonization, show that he is not now of opinion that this form of coal treatment is for all purposes going to rule the carbonizing world. Low-temperature and high-temperature carbonization processes are to-day conceded their respective places, rights, and privileges in connection with the world's affairs. This is precisely our own attitude. But still Mr. Marshall strives to show by comparison that his pet has superior virtues. It may have in some respects; but it has not so far as the man is concerned who has to deal with the distribution through pipes of B.Th.U. for all sorts of purposes. We are heartily in sympathy with all Mr. Marshall says, and with his statistical proof (whether or not this will stand a critical examination, except as being a rough estimate, need not be said) regarding the disastrous waste going on in the use of coal in household and factory. But when he ropes-in gas-works with other industries that are using coal "inefficiently," because they are not getting out the maximum value in bye-products, there must be protest, because, as it happens, high-temperature carbonization processes have their "aims and objectives," as well as low-temperature ones. "Inefficiently" is a term that must have regard to these aims and objectives. The wartime developments in the gas industry have, taking into consideration the "aims and objectives" of the gas industry, shown it how to obtain a still higher efficiency per ton of coal carbonized. If Mr. Marshall can show the industry a better way, then its gratitude will be unbounded.

However, we were talking of waste through the use of coal domestically and industrially; and Mr. Marshall appraises this waste at £133,000,000 in oils of various descriptions, pitch, and sulphate of ammonia, which last-named he calculates-out at 90 lbs. per ton of coal, and estimates its value at £15 per ton. In fact, nearly one-half of this waste of £133,000,000—or £60,150,000—Mr. Marshall puts to the credit of sulphate of ammonia. These are very full figures; and the 90 lbs. not a maintainable one with all coals. On the 100,000,000 tons which are taken to represent domestic and industrial uses (some of which coal would hardly be profitably suitable for either low or high temperature carbonization), the £133,000,000 of waste averages-out, without taking into account the revenue from the gas produced, to £1 6s. 7d. per ton! taking for the products principally gross pre-war values, which, in our contributor's opinion, will never, at least for many years, revert to these low figures. We sincerely wish we could agree with him. We look at the 90 lbs. of sulphate of ammonia per ton, at the £60,150,000 for the sulphate, and at the £15 per ton. From these figures we glance ahead. Mr. Marshall has been associated with a synthetic process of utilizing the nitrogen of the atmosphere; and he has been closely identified with Continental developments in connection with the fertilizers which will come into competition with sulphate of ammonia. What is his view as to the prospects of £15 per ton being a figure that will be commercially maintainable? We are not disposed to dispute the figure in respect of the immediate future; but what of the time beyond?

Thus we see a large reliance is being placed on sulphate of ammonia as a contributor to profits, through a remarkably high make per ton, and the maintenance of the £15 per ton. The sulphate of ammonia is not to be obtained by the low-temperature system, which needs the help of an ammonia recovery gas-producer in which the coke is to be gasified. By the way, Mr. Marshall makes a point as to the physical characteristics of the coke from the Tozer retort, with the development of which he has been identified. We have examined a sample of the coke. It is good sound coke; and it cannot be classed with the friable stuff that has been seen elsewhere, and which would not stand transportation. However, the physical characteristics need not be made much of if the coke is going to be treated in gas-producers for the making of 120,000 to 140,000 c.ft. of 120 to 130 B.Th.U. gas, which would not be the best quality for gas-works to have to distribute. At the Birmingham Gas-Works, coke dust from high-temperature carbonization is used in producers, and gas is made for heating and electricity generation. From the coke dust 40 to 50 lbs. of sulphate is derived per ton; and this more than covers the cost of the whole of the labour involved in the manufacture of the producer gas. From gas coke, 50,000 to 60,000 c.ft. of 300 B.Th.U. water gas can be produced. Taking the lower figure, this is equal to 15 million B.Th.U., which is half-a-million better than the product of 120,000 c.ft. multiplied by 120 B.Th.U. As the gas industry is concerned with the question of thermal values, we may take the comparison further. Mr. Marshall does not to-day give gas-works their full due in speaking of 12,000 to 13,000 c.ft. of gas per ton of coal. Confessedly this may be by a considerable preponderance the more general practice, through the impossibility of bringing into service at once the more modern methods, such as the steaming of charges and the use of blue water gas. But what is possible, and is actually being done, should be the place of reckoning. There are makes of 20,000 c.ft. per ton to-day with steaming in vertical retorts; and, after washing, the calorific value is not down below 450 B.Th.U., which is equal to 9,000,000 B.Th.U. The 10 cwt. of coke for sale is equal to 14,560,000 B.Th.U.; so that we have for the market 23,560,000 B.Th.U. The 5000 or 6000 c ft. of 650 B.Th.U. gas Mr. Marshall produces, after scrubbing, he tells us, is brought down to 400 to 450 B.Th.U. Taking the higher figures—the 6000 c.ft. and the 450 B.Th.U.—this is equal to 2,700,000 B.Th.U. The coke is all to be converted into producer gas, giving 14,400,000 B.Th.U.; so that the two last-named figures together give 17,100,000 B.Th.U., against the 23,560,000 B.Th.U. for the gas and coke capable of being produced by modern gas-making methods. However considered, from the standpoint of the gas supplier, the low-temperature system is not the equal of the high-temperature one.

Then, as to the liquid products, Mr. Marshall omits to give credit to the continuous vertical retorts using graduated temperatures, in which the coal is first submitted to a relatively low temperature, which, combined with steaming, reduces considerably any difference in respect of oil products between the low-temperature process and carbonization in gas-works retorts.

It is also remarked that the Power Sub-Committee of the Coal Conservation Committee of the Ministry of Reconstruction is put completely into the shade by Mr. Marshall. They do not anticipate that, under the best of circumstances, the huge super-power stations they recommend would show a higher efficiency than 13 p.ct. But is Mr. Marshall here offering the development of 1 kw.-hour for 110 c.ft. of 130 B.Th.U. gas used in a good gas-engine, which means (on the gas fuel basis) 24 p.ct. efficiency; or, using 200 c.ft. of the gas under a steam-boiler and the steam in a turbine, 13 p.ct. efficiency, with all the other products of the coal conserved. And it is calculated that the cost of 1 kw.-hour at the switchboard would not exceed ⅛d. to ⅛d. Some of those engineers who were not long since discussing gas and steam costs at the meeting of the South Wales Institute of Engineers [*ante* p. 217] will not be disposed to accept at their face value these submissions of Mr. Marshall—at any rate, the one as to generation by gas-engines.

However, it is not at all likely that the low-temperature process of carbonization is destined to deal with the coal used in domestic or industrial operations, except maybe in

private plants, which would have to be individual to each factory; and the probability is that such factories (not taking gas from the statutory suppliers) would adopt gas-producers. The direction which domestic and much industrial coal will take will gradually be towards the gas-works, wherein developments in still more efficient utilization are being made as opportunity offers. Without developments, such works already show the highest efficiency in coal utilization in the country.

Reconstruction and Counteracting Higher Costs.

On all hands, the men of the gas industry are being stripped of contentment with things as they have been. The industry wants to take part in the reconstruction work of the country; but coal, oil, and labour are impeding the materialization of ambition. But coal, oil, and labour must not be allowed to negative good resolve, if there are ways of counteracting their movements, or at any rate reducing their effects. Reconstruction in more senses than one supplied the foundation for the useful, if short, Presidential Address that Mr. A. E. Mottram, of Ossett, delivered at the meeting of the Manchester Institution of Gas Engineers last Saturday. The gas industry has got to move with the times; to supply what the people of these (and not of past) times require; and its technical men have to work their utmost to annihilate additional costs by economies and enlarged productions per unit of plant, per ton of coal, and per man, so that progress may not be stayed by the price of gas reaching, or remaining at, limits which will injure competitive power. The President has focussed in his own mind what must be done; but there is one omission. It does not apply to him; and the address supplies a very good reason for it not doing so. The omission is that he does not mention the need that exists in some places in the gas industry for scrapping old ideals formed in the past, and perhaps then applicable, but having no place into which they properly fit in the scheme of things of to-day. To them are attributable considerable immobility and indifference to the calls of the present time. Mr. Mottram says, and says right truly, that if the industry is going to take its part in the work to which the country hopes to be soon pressing forward, and is pressing forward, where temporary difficulties have not obstructed, it must scrap obsolescent plant, must modernize, must adopt labour-saving processes, must link-up for mutual help and protection, and must get the restrictions abrogated which restrain full economy coming to the credit of the industry. This is a big programme; but it has to be dealt with, and the sooner the better.

The lessons derived from his own experience at Ossett Mr. Mottram applies to guide him in determining how best to comply with the claims of the times, while reducing to the utmost the additional costs of materials and labour. Some years since he scrapped direct-fired, hand-operated retort plant; and deep regenerator horizontals took their place. The change paid very handsomely. Then the time came when it paid still more handsomely to construct plant on the intermittent vertical retort system. Coal and labour costs have become inflated to hideous dimensions. But consider these counter-strokes. The increased production of gas per ton that Mr. Mottram has obtained means an annual saving of 3000 to 4000 tons of coal, and handling, carbonizing, and other costs. The former eight retort-house men in summer and the twenty to twenty-four in winter, are represented to-day by four all-the-year-round men. There is steaming of the retort charges. The figures for one test given in the address show 15,325 c.ft. per ton of 519·6 B.Th.U. gas (total heat); and a shorter test tells of 18,554 c.ft. per ton of 479·7 B.Th.U. gas. Latterly, owing to coal shortage, there has been steaming with a view to get about 17,000 c.ft. of approximately 500 B.Th.U. gas; and the President thinks the probable standard of production in future will be 20,000 c.ft. of 450 B.Th.U. gas. In the actual production at Ossett, we have a valuable set-off—or partial set-off—to the extra expenditure occasioned by materials and labour. Further advantages, too, may be obtained from the secondary products, if proper attention is paid to them, but not without. Incidentally, it is seen Mr. Mottram agrees with a point we have more than once made, that to call valuable products "residuals" is to suggest something little better than waste. The nomenclature of the industry would bear a little revision.

But if we are going to attempt to counteract the new and largely, if not wholly, unwelcome additional obligations that have come upon the industry in the way of higher costs, our energies must not be limited to gas production. Mr. Mottram is wise in his advice that the change in the character of the gas must be accompanied by a house-to-house adjustment of gas appliances. In fact, the periodical inspection of gas consumers' appliances should become as much a part of the work of a gas undertaking as (though not at such frequent intervals) the inspection of gas-meters. Whatever work of reconstruction or business reinforcement the gas industry engages upon, it may depend upon it that its competitors are also moving in like directions. There is movement on all sides which will compel a higher standard of competitive effort; and the undertakings that realize this, and act upon it, will be increasing their power of resistance and their power of making advance.

An Eventful Week.

The past week was an eventful one. The Government began in very real earnest their reconstruction work; but some observers are of the opinion that they are attempting too much at once. In what they are doing they are proposing a sort of revolution in our social doings. The Bill for the establishment of a Ministry of Ways and Communications has been introduced. The proposed Ministry is to be a powerful one, with control over transport from railways to roads taking in canals and trams, with electricity bringing up the rear. The electricians do not like the position. They are of opinion that the point of view of the Ministry will be transport, and that the other uses of electricity will receive secondary consideration. The matter is referred to to-day in "Electricity Supply Memoranda." Transport is of immense importance to the gas industry; and it can only pray that transport reorganization will bring to it better conditions in this respect than it has hitherto had. If it aids the development of the country, it will also mean benefit to gas supply. In connection with roads, the industry, having such vast property in the subsoil, will have to keep a close guard upon its interests. The Ministry of Health Bill has also been introduced. This Ministry will probably have much to do with the housing question. Here, again, the gas industry will find interest, in connection with which there will have to be watchfulness to secure the fresh business. There has also been the National Industrial Conference at Westminster in association with the new National Industrial Council. Another paragraph shows that the gas industry was represented there, and will take part in future deliberations, from which all fervently hope that something will issue which will compose the relations between Capital and Labour, and give to the country internal peace.

The Coal Industry Commission.

But of immediate importance is the Coal Industry Commission. The Bill constituting it was introduced on Monday, and by Wednesday had passed through all stages in both Houses. The Prime Minister appealed to the miners to postpone the operation of their strike notices (82 p.ct. of the total votes recorded by the miners favoured a strike) until the end of the month; but he subsequently promised that an interim report on wages and hours should be issued by March 20. The Miners' Federation Executive have been less obdurate; no doubt feeling the effect of the widespread public resentment that has been aroused in consequence of the dictatorial attitude originally adopted. The Executive recommended the Miners' Conference, in view of the Premier's new offer, to postpone giving effect to the strike notices to March 22—a week later than the original intention. The Hon. Mr. Justice Sankey, C.B.E., is the Chairman of the Commission, who commenced their work yesterday. Sir Arthur Duckham, K.C.B., is a member. Associated with the grave coal position is an important decision of what is known as the triple alliance—the Miners' Federation, the National Union of Railwaymen, and the Transport Workers' Federation. The Executives of these bodies, at a conference last week, passed a resolution which stated that, having fully considered the position of negotiations in which the three bodies are concerned, and having regard to the very grave consequences involved in a stoppage by either body, and the fact that in the event of such a stoppage the members of each body would be very seriously and immediately affected, "we decide to adjourn this conference until each body has had an opportunity of further negotiation, and decide that no section of this triple

alliance shall agree to any action or settlement till this conference is again called together."

National Industrial Council.

The great industrial conference last Thursday, at the Central Hall, Westminster, from which the National Industrial Council is to emerge, ended with the appointment of a Joint Committee of employers and representatives of organized workers—thirty of each. Mr. D. Milne Watson, as President of the National Gas Council, was appointed to represent gas employers. An interested listener throughout the proceedings was the President of the Institution of Gas Engineers (Mr. Samuel Glover), who, by the way, had a pretty full week in town. He was one of the representatives of the gas industry at the luncheon, and what to all intents and purposes developed into a conference between interested parties, which was given by the National Benzol Association, as reported elsewhere.

A Defect in the Relief Act.

The holders of the Wimbledon stock in the Wandsworth, Wimbledon, and Epsom District Gas Company do not think much of the operation of the Statutory Undertakings (Temporary Increase of Charges) Act, nor of a decision of the Board of Trade. The matter was discussed between proprietors and the Chairman (Mr. H. E. Jones) at the meeting of the Company last Tuesday; but no amount of discussion outside the Houses of Parliament can alter an Act, or is likely to reverse a decision of the Board of Trade. The Wimbledon class of stock is subject to a different standard price from the other stocks; and the result is that the dividend upon it under the sliding-scale is now 7s. 6d. below the three-quarters of the standard dividend allowed by the Act. The Directors applied under the Act for relief for the Wimbledon stock; but the Board of Trade decided that the Act does not permit of relief to a single class of sliding-scale stock in a Company whose other classes of stock have not come down to the relief level. The Act itself does not say this; but there is no express provision for dealing with such a condition. This being so, and the Wimbledon part of the Company's undertaking working under sliding-scale terms of its own, one would not have hesitated to conclude that the Wimbledon stock would have a right to the relief sought. But the Board of Trade have determined otherwise. If they are right in their decision, then there was a distinct oversight in the drafting of the Act in not providing for such an eventuality as has arisen here.

A Municipal Group in Parliament.

It is reported that it is almost a daily occurrence now for a fresh banding together of members of Parliament for the protection of the interests in which they are personally concerned. There can be no great objection to this up to a point; but it is obvious that such banding together cannot result in unbiassed judicial decision where these interests come into question. One of the latest groupings is that of members of Parliament concerned in Municipal Associations; and this group is designed specially to watch over local government interests. We hope the group will be leavened with a number of municipal representatives with the progress of the gas industry at heart. Sir Hallewell Rogers is a strong municipal man in the House; and he is also a strong gas man.

Summer Time.

The gas industry has got quite used to the utilization by their customers of an additional hour's daylight in the summer mornings, and the cutting-off of an hour of gas lighting by them at night-time. There is to be a repetition this year; and we suppose, as there is popular approval, the change will be a regular one. This year we are to have a week less of it—at the start. On the morning of Sunday, March 30, we shall be expected to rise an hour earlier; and thereafter go to bed an hour sooner. This will continue till Sunday night, Sept. 28, when the timepieces will be put back an hour. On "summer time" being adopted in 1916, it commenced on May 21; a month earlier in 1917; while last year March 24 witnessed the change. "Summer time" in France began last Saturday. The period will therefore be a month longer than in this country.

Capital Issues.

What was promised to be some relaxation of control over new capital issues proved, when the regulations were issued by the Treasury, to be exactly the reverse; and the Government and the Treasury found themselves faced with an incensed financial and industrial world. In the House, the Government were soon shown that the Treasury had made a grave mistake; and what they were proposing would have made business next to impossible when development and not restriction is so vital. The regulations would have even prevented the renewal of bank loans without going through the formality of obtaining a licence. Many gas undertakings would have found themselves in a pretty predicament. However, the regulations have been withdrawn, and new ones are under consideration. The Treasury will be a little more careful in their framing.

Gas-Coal Stocks.

It is gathered from the "Iron and Coal Trades Review" that the position of gas-coal reserves, as shown by the latest list issued from the Coal Controller's Department, is in the aggregate much the same as the previous list. Some 81 works have less than a week's supply in sight (including 29 with less than three days' stock), and 100 works have less than two weeks' supply.

SIR GUY CALTHROP'S SUCCESSOR.

The President of the Board of Trade has appointed Mr. C. Hipwood, C.B., to be Acting Controller of Coal Mines, pending the appointment of a permanent successor to the late Sir Guy Calthrop. Mr. W. A. Lee will continue to act as Secretary of the Department and will be responsible for dealing with export and prices questions.

GAS WORKERS WAGES ARBITRATION.

The following text of the award of the Arbitrators in the matter of the wages to be paid to gas workers has been forwarded for publication.

Court of Arbitration.—Gas Workers.

1. The parties to this reference are: (1) The National Gas Council, and (2) the National Federation of General Workers—representing the Unions affiliated thereto.

2. The claim submitted was for:
   (1) An advance of 10s. per week to adults, 18 years of age and over, employed on time-rates.
   (2) An advance of 5s. per week to workers under 18 years of age, employed on time rates.
   (3) A proportionate advance in the case of those employed on piece-rates.
   (4) Future advances to take place on the same date as advances in other industries.

3. The matter was referred by the Ministry of Labour to the Court of Arbitration for settlement, and representatives of the parties were heard on the 20th of February, 1919.

4. The men concerned have received war advances amounting to a maximum of 23s. 6d. a week, *plus* a bonus of 12½ p.ct. and 7½ p.ct. on earnings for timeworkers and pieceworkers, respectively, 21 years of age and over.

The Award of the Court is as follows:

5. The men and women concerned, aged 18 years and over, shall receive an advance of 5s. a week, payable at the rate of 10d. a day or shift for each day or shift worked.

6. To boys and youths and girls, under 18 years of age, there shall be paid an advance of 2s. 6d. a week, payable at the rate of 5d. a day or shift for each day or shift worked.

7. In the case of pieceworkers, the amount is to be paid by the undertakings at the rate of 5s. per full ordinary week over and above the week's earnings of the workpeople concerned, calculated on the present basis.

8. The amounts hereby awarded are to be taken into account in the calculation of payment for overtime and night duty, and for work on Sundays and holidays (where extra payments are made for such work).

9. With regard to item (4) of the claim, the Court are not prepared to give a ruling as to the date when future advances shall take place.

10. The rates in force on the 11th of November, 1918, as modified by the advances provided for under this award shall be, and shall be deemed to be, the substituted rates of wages for the purposes of the Wages (Temporary Regulation) Act, 1918.

11. This award shall take effect as from the beginning of the first full pay following the 1st of February, 1919.

(Signed) William W. Mackenzie.
John M. Denny.
F. S. Button.

H. M. Hooke, *Secretary*,
5, Old Palace Yard, S.W.

CONGRESS OF THE SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

In Metz this Year.

IT is announced that the Congress of the Société Technique du Gaz, the first to be held on any scale since the outbreak of war, will be at Metz next July. An invitation to meet in the liberated Lorraine town has been extended by M. Th. Vautier, a former President of the Society. Inasmuch as the date of the foundation of the Society was 1874, the forthcoming Congress will mark the first occasion on which a meeting has been held in the Provinces which are now again joined to France.

It is intended to arrange excursions to Strasburg and Mulhouse, and, naturally, plans are being made for a lengthy programme of technical communications. The congress will also be made the opportunity of conferring awards upon workmen of French gas companies who have completed long terms of service. A series of prizes is also announced to be awarded for contributions towards the advancement of the gas industry. The branches specially designated in this connection are: (1) Plant for the manufacture of gas. (2) Appliances for the industrial or domestic use of gas. (3) Incandescent gas-burners. (4) Automatic or distance lighting of gas. (5) Producers of water-gas from gas coke. The prizes offered in all five sections are open for competition by those in any country; but since the documents describing the features and successful application of any system or appliance cannot be accepted on a later date than next Saturday week (March 15), it cannot be expected that there will be any considerable contribution from countries other than France.

The arrangements for the Congress are in the hands of the General Secretary of the Society, whose address is No. 12, Rue de Clichy, Paris.

PERSONAL.

Sir ARTHUR DUCKHAM, K.C.B., is a member of the Royal Coal Commission, who, under the chairmanship of the Hon. Mr. Justice Sankey, commenced their work yesterday, the issues of which are of critical moment to the country.

It is understood, says "The Times," that Lord MOULTON has accepted the chairmanship of the proposed new Company, the British Dyestuffs Corporation, which is to be formed to acquire the shares of British Dyes and Levinstein, Ltd., Manchester, the two largest dye-producing works in Great Britain.

Following the annual meeting last Friday of stockholders in the Aldershot Gas, Water, and District Lighting Company, at a special meeting of the Board of Directors, Mr. W. T. ROBERTSON, J.P., tendered his resignation as Chairman, but retaining his seat on the Board. Mr. Robertson has been on the directorate since 1898, and Chairman for the past ten years. Mr. R. W. EDWARDS was unanimously elected Chairman, retaining also his position as Managing Director. Dr. F. STROYAN, J.P., was re-elected Deputy Chairman.

Out of thirty-nine applications, Mr. JAMES MITCHELL, the Chief Assistant to Mr. Alex. Yuill, the Engineer and Manager of the Dundee Gas-Works, was, at a meeting of the Nelson (Lancs.) Town Council, appointed Engineer and Manager of their gas undertaking at a salary of £550. Mr. Mitchell, who is thirty-five years of age, is the elder son of the late Mr. Robert Mitchell, of Edinburgh. He was educated at George Watson's College, Edinburgh, and received his technical training at Heriot-Watt College, afterwards serving his articles as a mechanical engineer with Messrs. Brown Bros., of Edinburgh. Prior to Mr. Mitchell's appointment at Dundee he acted for over five years as Manager of the Montrose Gaslight Company; and during his tenure of office, the works were practically reconstructed and the output of gas increased by 40 p.ct.

The Directors of the Sheffield Gas Company announce with great regret, in their annual report, the impending retirement of Mr. HANBURY THOMAS, who, they point out, first as General Manager, and subsequently as Managing Director, has rendered loyal and devoted service to the Company for a period of 36½ years. They desire to place on record their appreciation of his work—more especially during the strenuous years of war just passed through.

Mr. W. S. ESSON has been appointed Gas Manager at Peterhead. He is a son of the Manager of the Selkirk Gas-Works, and was for seven years Assistant Manager there. Since then he has been for ten years Gas Manager at Jedburgh. Mr. Esson gained his early experience at the Perth Gas-Works, and for three years was Assistant Gas Manager to the Maybole Gas Company.

Mr. E. SMITH, Engineer and Manager of the Corporation Gas-Works at Denton, near Manchester, has resigned the position, after twenty-five years' service.

Dr. L. J. TERNEDEN, the Manager of the Southern Gas-Works at Amsterdam, has been appointed General Manager of the Amsterdam Municipal Gas-Works in succession to the late Heer J. van Rossum du Chattel.

SOFTENING-POINT OF PITCH.

It was stated by Messrs. P. E. Spielman, Ph.D., F.I.C., B.Sc., and G. C. Petrie, F.I.C., A.R.T.C., in a paper on this subject read by them before the Newcastle Section of the Society of Chemical Industry, that the softening-point of pitch occurred at no particular moment. On any rise of temperature, the pitch gradually and imperceptibly changed from a brittle or exceedingly thick and slow-flowing material to a softer and less viscous liquid. For this reason, the softening-point had to be assumed at an arbitrarily fixed point; and many attempts had been made to standardize it and make it easily reproducible. The ½ inch cube method had been found to be simple and reliable within limits. A cube of pitch of ½ inch side length is suspended in a beaker of water by a copper wire of about No. 18 gauge at right angles and inserted into the centre of one side of the cube. The distance between the base of the cube and the bottom of the beaker is to be from 3 to 3½ inches. The temperature is noted when the pitch has descended to within ½ in. of the bottom of the beaker. This test is unsuitable for testing hard pitches, owing to the buoyant action of air bubbles which appear on the surface of the block. These are most difficult to remove at temperatures over 70° C., when the surface of the pitch is softening. Further, the time taken when heating the water at the rate of 1° per minute is much longer than in the case of another method proposed.

A pitch-block 1½ in. long by ½ in. square was made. A piece of copper wire of No. 17 standard gauge was bent in the form of an "L," the foot of which was ¾ in. long. The shaft was heated gently in a Bunsen flame until the foot was sufficiently hot to penetrate the block. The point of insertion of the wire was the side of the block, ½ in. from one end. The wire must pass through the block systematically. After cooling for three hours, the foot of the "L" exterior to the block was scraped free from adhering pitch. The block was suspended about 2 in. below the surface of cold water (freshly boiled) in a beaker of 750 cc. capacity. A thermometer with its bulb on a level with the block, and an arrangement for stirring, completed the apparatus. Heating at the constant rate of 1° per minute was preferably carried out with an argand burner; the water being stirred slowly at intervals until the determination was almost complete. The flame was removed when the upper horizontal edge (which must be sharp) of the cube came into line with the upright copper wire. Stirring was continued until the temperature began to fall. The maximum temperature observed was taken to be that of the softening-point of the sample. Different rates of heating, especially with soft to medium pitches, gave results which varied up to 40° C. For a hard pitch, 3° C. per minute could be adopted in cases where a rapid test was essential.

AMMONIUM SULPHATE AND NITRATE AS FERTILIZERS.

A recent short paper before the Paris Academy of Sciences by M. Th. Schlœsing describes some experiments made with the view of determining the relative fertilizing qualities of ammonium sulphate and nitrate.

M. Schlœsing worked by raising small crops of the coarse yellow maize in pots containing 8 kilos of earth, the content of moisture in which at the outset was 12·9 p.ct. To each pot 15 gms. of a basic fertilizer—di-potassium phosphate—were added; and the same quantity of seeds were sown in each. The two nitrogen fertilizers were added by dissolving the quantity representing 3·37 gms. of nitrogen in water with which the contents of the pots were sprinkled. The crop was cut level with the soil at the stage when the blade showed incipient or slightly developed ears. The results are shown in the following table:

—	Check—without Addition of Nitrogen Fertilizer.	Addition of	
		Ammonium Sulphate.	Ammonium Nitrate.
	Gms.	Gms.	Gms.
Nitrogen added as fertilizer .	0	3·37	3·37
Mean weight per pot of crop. { Green as cut .	368	671	669
Mean weight per pot of crop. { Dried slowly in the air }	87·6	106·8	108·4
Air-dried crop; crop without added nitrogen = 100 .	100	122	123·7

In adding some notes on the making of comparative tests of fertilizers in this way, M. Schlœsing points out the advisability of confining the area of soil on which comparative crops are raised to relatively small dimensions. Where, with the object of giving the tests a more practical character, comparatively large patches are cultivated, differences in the composition and physical character of the soil are sufficient to vitiate the tests. In operating upon a smaller scale, seeds and fertilizer can be weighed with any required degree of accuracy.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

IN THE HALF YEAR ENDED DECEMBER 31, 1918.

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gas Light and Coke.	South Metropolitan.	Commercial.	Wandsworth.	South Suburban.	Tottenham.	Brentford.
	(Year's figures.)						(Year's figures.)
Gas sold . . . . . thousands	26,418,746	5,926,848	1,717,575	1,205,134	1,137,833	1,101,904	4,102,246
Increase . . . . . per cent.	Dec. 6·89	Dec. 12·11	Dec. 2·98	Dec. 9·08	Dec. 12·26	Dec. 2·46	Dec. 7·08
Gas made per ton of coal carbonized. cubic feet	11,953	12,495	13,394	12,092	11,299	11,425	11,438
Gas unaccounted for . . . . . per cent.	8·02	7·45	7·72	8·76	12·42	8·06	7·23
Coke made for sale per ton of coal . cwt.	9·92	10·12	11·77	10·47	7·89	8 06	9·99
Tar made per ton of coal. . . . . galls.	9·32	9·64	10·25	8·20	..	9 61	11·52
Liquor made per ton of coal . . galls, 8 oz.	34·50	41·07	36·55	36·00	37·87	30 00	35 95
Percentage of coke used as fuel	18·34	17·54	12·82	16·23	34·22	35·73	20·08
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year	10 9·33	8 11·25	8 5·87	8 0·06	8 7·38	9 9·10	6 10·03
Price charged per 1000 cubic feet	3/10 to 4/4	4/0 and 4/4	3/10 and 4/2	3/5 to 4/8	{3/10 to 5/0 / 4/3 to 5/5}	3/8 to 4/5	3/4 and 4/0
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	33·37	40·03	35·58	36·32	33·41	33·17	34·30
Less residuals—Coke and breeze.	11·94	15·66	11·58	11·06	10·60	9·73	7·61
Tar	3·26	3·34	2·44	2·61	2·09	2·20	2·88
Amm. liq. and sulph. amm.	2·27	2·84	2·22	1·70	2·09	1·41	1·50
Total residuals . . .	17·47	21·84	16·24	15·37	14·78	13·34	11·99
Net for coals, oil, &c. .	15·90	18·19	19·34	20·95	18·63	19·83	22·31
MANUFACTURE—							
Salaries	0·32	1·03	·63	·66	·90	·37	0·57
Wages—carbonizing	3·60	3·60	3·00	4·37	3·32	2·71	2 98
Purification	0·50	·89	·32	·31	·57	·89	0 53
Repairs—plant	7·83	9·33	6·23	7·69	6·30	6·48	6 91
Net manufacture . .	28·15	33·04	29·52	33·98	29·72	30·28	33·30
DISTRIBUTION—							
Wages and salaries	1·65	1·43	1·28	2·19	2·12	·91	1·53
Repairs—Mains and services, &c.	2·04	1·90	1·50	1·57	2·39	1·63	1·61
„ Meters and prep. meters and fittings.	2·35	2·69	2·48	1·40	2·55	1·94	1·32
„ Stoves—ordinary and prepayment .	1·87	·92	1·89	1·57	1·93	·90	1·74
Total net manufacture and distribution .	36·06	39·98	36·67	40·71	38·71	35·66	39 53
Public lamps—lighting and repairing	0·65	·93	·65	·84	·84	·17	0·41
Rents, rates, and taxes	3·86	2·20	2·07	1·56	2·36	1·24*a*	2·12
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.)	0·29	·37	·41	·65	·93	·52	0·48
Collectors	0·83	1·25	1·46	·86	·97	·55	0·77
Stationery and general charges.	0·40	·79	·74	·70	·60	·68	0·43
Profit-sharing	0·36	..	·26	..	·17	·16	..
Bad debts.	0·06	·03	·02	·07	·01	·01	0 05
Law and parliamentary charges	0·03	·06	·11	·15	·23	·04	0·20
Superannuations, &c.	0·50	·38	·39	·30	·42	·45	0·46
National Insurance	0·08	·20	·08	·08	·07	·07	0 06
Active service allowances	0·15	·36	·51	·35	·46	5·34*b*	0·37
Sundries	0·04	·05	·02	·03	..	..	0 00
Total expenditure (*less* residuals) . . .	43·31	46·60	43·39	46·30	45·77	41·89	44·85
GAS.	48·19	48·31	45·50	46·32	49·99	44·33	44 79
Rentals—Meters and prep. meters and fittings.	2·83	3·02	3·31	2·98	2·57	2·16	4·20
Stove	1·68	1·44	2·00	2·83	2·15	4·17	1·33
Incand. mantle maintenance . . .	..	..	·11	·15	..	·03	..
Miscellaneous	0·15	·07	·00	·10	·06	·12	0·01
Total—Gas, rentals, &c.	52·85	52·84	50·92	52·38	54·77	50·81	50·33
Balance, being profit	9·54	6·24	7·53	6·c8	9·00	5·92	5·48
Dividend and interest	8·36	6·39	6·28	5·75	6·26	6·02*c*	5·04
Surplus or deficit	1·18	Def. ·15	1·25	·33	2·74	Def. ·10	0·44
Contributions to funds and sundry payments .	..	..	..	..	..	..	0·01*d*
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	33 10·64	37 11·60	37 7·78	39 5·44	..	31 10·86	..
Coke realized per ton of coal	13 8·06	14 9·58	17 3·40	12 5·20	11 1·21	12 1·87	10 11·39
Coke „ „ of coke	27 6·79	29 3·09	29 4·46	23 8·97	28 1·64	30 2·13	21 10·99
Breeze „ per ton	3 10·51	1 3·14	1 10·83	3 2·81	6 2 65	2 6·19	3 6·04
Tar realized per gallon	0 4·95	0 3·94	0 4·12	0 4·04	0 2·75	0 3·36	0 4·05
Amm. liquor, &c., realized per butt (8 oz.) . .	8 4·74	7 1·11	9 10·94	5 11·79	6 5·66	6 5·66	6 6 77
Percentage of stoves at rental to consumers . .	88	103	76	99	112	69	98
Bad debts per cent. on total receipts	0·09	·04	·03	·10	·01	·01	0·08
Net profit per cent. on ordinary capital . . .	3·76	2·89	3·76	4·12	6·22	3 86	3·89
One penny variation equals in half year . . .	£110,078	£24,695	£7157	£5021	£4741	£4591	£17,093
Water gas, per cent. on total make	23·81	..	32·76	23·71	25·34	32·70	40·13

a Rent and Rates only.
b Includ ng 4·84d. for War Wage.
c Including 1·53d. Income-Tax item.
d Stamp duty.

Gas Light and Brentford figures are based on a full year's accounts.

COMPARATIVE WORKING RESULTS OF THE THREE METROPOLITAN AND FOUR OF THE SUBURBAN GAS COMPANIES.

TABLE SHOWING THE VARIATION, INCREASE OR DECREASE, ON FIGURES OF CORRESPONDING HALF YEAR, 1917

[The figures in heavy type show the decreases.]

Compiled by Mr. F. J. BRADFIELD, the Secretary of the Commercial Gas Company.

	Gas Light and Coke.	South Metropolitan.	Commercial.	Wandsworth.	South Suburban.	Tottenham.	Brentford.
	(Year's figures.)						(Year's figures.
Gas sold . . . . . thousands	**1,954,109**	**816,704**	**52,797**	**120,379**	**158,966**	**27,744**	**312,878**
Increase (variation equal to) . . . per cent.	**12·77**	**19·46**	**4·33**	**14·98**	**31·14**	**2·31**	**19 68**
Gas made per ton of coal carbonized. cubic feet	**18**	178	764	**164**	**511**	**653**	**279**
Gas unaccounted for . . . . . per cent.	**·40**	**·48**	**1·18**	1·28	1·88	**2·42**	**·54**
Coke made for sale per ton of coal . cwt.	**·15**	**·04**	**·61**	**·16**	**1·03**	**·13**	**·01**
Tar made per ton of coal . . . . galls.	**·27**	**·17**	**·26**	**·97**	..	**·53**	**·62**
Liquor made per ton of coal . . . galls, 8 oz.	**·95**	2·15	1·21	5·48	2·40	**1·09**	**1 19**
Percentage of coke used as fuel	**·66**	**·60**	**1·35**	1·29	4·75	1·32	**·12**
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended per 1000 cubic feet sold during the past year	0 6·72	0 11·35	0 2·46	0 4·92	0 5·79	0 7·69	0 6·33
Price charged per 1000 cubic feet‡	-/10, -/6 & 1/-*	-/11 and 1/3	-/8 and 1/-	-/11 and -/10	-/9 and 1/2	-/4 and -/8	-/6, 1/2, and -/8*
Costs per 1000 Cubic Feet of Gas Sold.							
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	3·99	7·27	3·74	5·44	3·60	5·23	6·57
Less residuals—Coke and breeze	·64	2·83	·88	**1·13**	·81	3·34	**·75**
Tar	·32	·09	**·08**	**·33**	·58	·61	**·92**
Amm. liq. and sulph. amm.	**·38**	·16	**·18**	**·29**	**·23**	·22	·00
Total residuals . .	·58	3·08	·62	**1·75**	1·16	4·17	1·67
Net for coals, oil, &c.	3·41	4·19	3·12	7·19	2·44	1·06	4·90
MANUFACTURE—							
Salaries	·04	**·25**	**·17**	**·25**	**·34**	**·05**	**·14**
Wages—carbonizing	**·92**	**·83**	**·84**	**2·15**	**1·65**	**0·6**	**1·24**
Purification	**·22**	**·17**	**·14**	**·26**	**·36**	**·33**	**·30**
Repairs—plant	**1·85**	**2·50**	**1·57**	**2·57**	**1·08**	**·29**	**2·31**
Net manufacture . .	6·44	7·94	5·84	11·90	5·87	1·67	8·89
DISTRIBUTION—							
Wages and salaries	**·41**	**·38**	**·23**	**·91**	**·74**	**·03**	**·47**
Repairs—Mains and services, &c. . . .	**·19**	**·78**	**·17**	**·04**	**·78**	**·33**	**·48**
,, Meters and prep. meters and fittings	**·72**	**·60**	**·28**	**·41**	**·97**	**·55**	**·36**
,, Stoves—ordinary and prepayment .	**·17**	**·18**	**·16**	**·44**	**·66**	**·29**	**·21**
Total net manufacture and distribution	7·93	9·88	6·68	13·70	7·70	1·63	10·41
Public lamps—lighting and repairing	**·13**	**·22**	**·19**	**·34**	**·35**	**·04**	**·14**
Rents, rates, and taxes	**·66**	**·58**	**·30**	**·42**	**·48**	**·08**	**·27**
MANAGEMENT—							
Directors, Auditors, and salaries (Secretary, &c.).	**·05**	**·09**	**·06**	**·11**	**·25**	**·04**	**·07**
Collectors	**·17**	**·38**	**·46**	**·40**	**·47**	**·04**	**·28**
Stationery and general charges	**·13**	**·13**	**·21**	**·15**	**·22**	**·10**	**·03**
Profit-sharing	**·34**	..	**·06**	**·07**	**·08**	**·16**	..
Bad debts	**·01**	**·01**	**·02**	**·00**	**·01**	**·03**	**·00**
Law and parliamentary charges	**·02**	**·03**	**·09**	**·13**	**·04**	**·02**	**·19**
Superannuations, &c.	**·05**	**·14**	**·01**	**·03**	**·06**	**·11**	**·02**
National Insurance	**·01**	**·04**	**·00**	**·01**	**·00**	**·00**	**·00**
Active Service allowances	**·00**	**·10**	**·01**	**4·12†**	**3·09†**	2·86	**2·14†**
Sundries	**·01**	**·01**	**·01**	**·01**	..	..	**·00**
Total expenditure (*less* residuals) . .	9·45	11·31	7·46	11·09	6·43	4·75	9·27
GAS	10·34	12·37	9 63	10·34	11·14	4·46	8·45
Rentals—Meters and prep. meters and fittings	**·24**	**·06**	**·48**	**·12**	**·29**	**·06**	**·39**
Stove	**·16**	**·01**	**·05**	**·21**	**·29**	**·02**	**·18**
Incand. mantle maintenance . . .	..	..	**·01**	**·02**	..	**·01**	..
Miscellaneous	**·02**	**·02**	**·00**	**·06**	**·00**	**·06**	**·00**
Total—Gas, rentals, &c.	10·28	12·34	10·17	10·75	11·72	4·59	9·02
Balance, being profit	**·83**	**1·03**	**2·71**	**·34**	**5·29**	**·16**	**·25**
Dividend and interest	**·62**	**·65**	**1·28**	**·85**	**·48**	**·02**	**·02**
Surplus (variation equal to)	1·45	1·68	3·99	**·51**	4·81	**·14**	**·23**
Contributions to funds and sundry payments .	**·58**	**·11**	..	..	..	..	**·08**
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	5 7·57	7 6·23	3 4·37	8 9·72	..	3 10·32	..
Coke realized per ton of coal	1 4·01	2 11·70	3 5·58	0 5·82	0 6·43	2 10·16	0 9 61
Coke ,, ,, of coke	2 3·86	5 9·58	4 7·22	1 3·28	4 5·35	6 8·56	1 6 92
Breeze ,, per ton	0 11·58	**0 9 89**	0 0·46	**0 8·50**	3 6·68	1 6·38	**3 6 23**
Tar realized per gallon	0 0·81	0 0·11	0 0·28	0 0·44	0 0·73	0 0·58	0 1 31
Amm. liquor, &c., realized per butt, 8 oz. .	**1 2·67**	0 2·31	1 1·28	**1 2·63**	**1 3·15**	0 4·73	**0 0 27**
Percentage of stoves at rental to consumers .	**2**	..	..	..	..	**3**	**2**
Bad debts per cent. on total receipts . . .	**·03**	**·02**	**·05**	**·02**	**·03**	**·07**	**·01**
Net profit per cent. on ordinary capital . . .	·22	·45	1·71	**·62**	3·94	**·28**	**1 0**
One penny variation equals in half year . . .	**£8142**	**£3403**	**£220**	**£502**	**£662**	**£116**	**£1. 0**
Water gas per cent. on total make	3·69	..	5·07	14·12	4·72	**7·10**	**1·38**

‡ These figures show the variation in price in the Companies' principal areas. * Last six months of the year. † 1917 figures include war bonus.

OBITUARY.

The Bridport Gas Company have recently lost by death their Chairman, Mr. J. T. Stephens, J.P., and Vice-Chairman, Mr. J. Suttill, J.P. The former, who was in his 78th year, had been on the Board for 40 years, and Chairman during the last 28 years. Both were gentlemen of conspicuous abilities, and occupied prominent local positions.

Placing on record with the deepest regret, in their report, the death last October of the late Chairman, Mr. Robert Thornton, J.P., the Directors of the Longwood and Slaithwaite Gas Company remark that he had taken almost a life-long interest in the undertaking. On its formation in 1859, he acted as the first Secretary of the Company. In 1882 he joined the Board, and became Chairman in 1906.

Mr. J. Falconer King, F.I.C., F.C.S., whose death has recently occured, held the appointment of City Analyst at Edinburgh for a period of about forty years, retiring from the position in 1913. In addition to this, he was Public Analyst and Analyst under the Fertilizers and Feeding Stuffs Act for several of the Scottish counties. Another public analyst has passed away in Mr. Thomas Fairley, Gas Examiner and Analyst to the Leeds City Council, who died recently at the age of 76.

The death took place last Wednesday of Mr. H. H. Mercer, the Deputy Manager of the Widnes Gas and Water Works. The cause of death was pneumonia, following a short attack of influenza. Mr. Mercer was in the prime of life—a healthy and robust man of 38. He had for some ten years been Mr. Isaac Carr's right-hand man at the gas-works. The latter feels Mr. Mercer's loss keenly. "He was the most valuable man and best colleague I ever had with me," he said.

Mr. Percy Watson Copeland, B.Sc.(Lond.), F.I.C., the Chief Chemist to the Derby Gas Company, died last Saturday week, at the early age of 34. He was taken ill with influenza at the beginning of the week; but right up to the day of his death a fatal result was not anticipated. In fact, Mr. J. Ferguson Bell was looking forward to him resuming his duties in the course of a few days. Mr. Copeland joined the staff of the Derby Gas Company some five-and-a-half years ago, having been formerly assistant to Mr. L. Archbutt, F.I.C., the well-known Chief Chemist to the Midland Railway Company. His sudden removal in the prime of life is a great loss both to the Company and to Mr. Bell personally. Indeed, his technical skill and conscientious discharge of his duties, together with his high character, endeared him to the whole of the staff. Sad to relate, Mr. Copeland's wife also was attacked with influenza, and passed away two days later than her husband. Both were interred at Belper Cemetery last Thursday. In a letter full of regret, Mr. Bell says: "Mr. Copeland was far above the ordinary. Being an accomplished chemist, he carried out original research, and had he lived would have occupied a high position in the chemical world, as an analytical chemist who loved his work for its own sake. I hope we shall be able to maintain the high level he brought our Chemical Department to at Derby."

Masonic—Northern Star Lodge.—No. 3053.

The Installation Meeting of this Lodge was held last Friday at the Midland Hotel, Manchester; the attendance numbering 90 members and visitors. Bro. Joseph Taylor was duly installed W. M. by the retiring Master, W. Bro. J. W. Morrison. The other officers appointed were:

W. Bro. T. Ousey, P.Pr.G. Stwd. (Cheshire)	S.W.
W. Bro. R. H. Garlick	J.W.
W. Bro. L. B. Taylor	Chaplain
W. Bro. W. Whatmough	Treasurer
W. Bro. Wm. Batt, P.Pr.G.S.D., P.Pr.G.D.C. (West Lancs)	Secretary
W. Bro. J. W. Broadhead, P.Pr.G.S.D. (West Yorks)	D.C.
W. Bro. A. J. Harrison	S.D.
Bro. M. L. Williams	J.D.
Bro. Ernest West	I.G.
W. Bro. S. Meunier	A.D.C.
W. Bro. J. M'Ewen	Assistant Secretary
W. Bro. T. W. Jordan	Organist
W. Bro. R. J. H. Sayers, P.Pr.G.A.D.C. (West Lancs)	Almoner
Bro. P. D. Walmsley Bro. Samuel Shadbolt Bro. Major F. W. Richmond Bro. J. W. Turner Bro. Chas. Fairweather Bro. Jas. Bridge Bro. R. H. Brown	Stewards

At the social board there was an auction sale of war relics, which realized about £82 for the East Lancashire Charities. Attention was called to the fact that the W. M. of the "Evening Star" Lodge, W. Bro. Fred. J. West, and the W. M. of the "Murdoch" Lodge, W. Bro. Luke B. Taylor, were both Founders of the "Northern Star" Lodge. The toast of the "Sister Lodges" was, in the absence of W. Bro. West (due to an attack of influenza), responded to by W. Bro. Archibald P. Main for the "Evening Star" Lodge and by W. Bro. Luke B. Taylor for the "Murdoch" Lodge. W. Bro. W. Batt, the Secretary of the Lodge, was unable to attend on account of illness.

BENZOL PRODUCERS AND USERS PLEDGED TO CO-OPERATION.

Benzol producers, benzol refiners, users of benzol, would-be users—and particularly motorists—and others interested in the expansion of the benzol industry, met together in large force round luncheon tables at the Prince's Restaurant, Piccadilly, last Wednesday. They were there by invitation of the Chairman (Mr. D. Milne Watson) and the General Committee of the National Benzol Association. It was a representative and influential force of the interests concerned to-day in benzol; and these interests show considerable ramifications. The occasion was the inauguration of the Association. It gave the opportunity for stating facts and learning more as to what can be done on the one side and what is wanted on the other; and there was a pledging of co-operation, which is so very desirable at this stage of the benzol movement. To this movement the event was of the highest importance. The lunch was thoroughly enjoyed; and the speeches which followed plainly indicated that all parties mean business. The chair was occupied by Mr. Milne Watson.

Lunch ended, the loyal toast was honoured.

An Independent Marketing Policy.

The Chairman at once entered upon the business part of the proceedings. He said he rose to give those present a very cordial welcome to their table that day. The General Committee of the National Benzol Association had asked those present to meet them because there had been, up and down the country generally, a great amount of interest in the doings of the new organization. Therefore they thought it would be quite a right and proper thing to meet together, and, without any great amount of formality, talk things over. The benzol production of the country, as those present all knew, had been largely stimulated by the war. It was quite a small thing before the war; but during the war it had reached very large proportions. The Government were anxious for the production of as much benzol as possible, and so asked various bodies in the position to produce benzol to do so as freely as they could. The result was that a very large amount of benzol had been recently produced in the country, and had gone a long way to help to win the war. The Government kindly lent their help with regard to priority, as well as finance; so that at the present moment they had an industry fully equipped. The question the moment the Armistice came about was what was going to be done with the heritage they had got. Was it to be scattered, and benzol become a thing of the past? He said emphatically, "No." [Hear, hear.] It was true fortunately that benzol was no more wanted—at any rate, not in the quantities previously dealt with—for the purposes of the arts of war. But it was required still more every day for the arts of peace. They formed themselves tentatively into an Association for the purpose of supporting one another in dealing with the whole question on broad lines; and he was sure all present would be interested to hear that the National Benzol Association had now become an established fact. Furthermore, he felt certain they would be interested to know that that day they had decided to be their own distributors. He did not disguise the fact from those present, or from himself, that this was a very serious step indeed that they had taken; but he believed they had taken the right one. [Hear, hear.] They felt it would have been opposed to the interests of benzol to have allied themselves with any of the great petrol companies. They had therefore taken their courage in both hands; and they had said that they were going to be masters in their own house, and of their own product. Of course, they knew there were many difficulties in front of them. They knew the matter was not going to be a simple one. But they trusted that, with the goodwill of the motorists, they would pull through. They had already standardized the quality of the benzol; and he believed this was satisfactory. If it was not, it would be the business of the Association and of the new Company which was about to be formed to see that the quality was of a nature that would satisfy the motorists. He knew the necessity and desirability from the country's point of view of having a home-made motor spirit. He quite agreed this was of great importance; and he dare say they would all concur with him that it was very desirable to keep in existence the organizations and the production which, as he had said, had tended so much to the satisfactory ending of the war. But, of course, they knew with regard to motoring that they would have to put their organization on a thorough business footing. They did not expect motorists to use benzol simply because it was a good thing that there should be a home-made motor spirit; and, therefore, it would be their business to satisfy the motoring public in regard to quality and price. Benzol was a good motor spirit; and, if they were going to keep it out of the hands of the petrol interests, the motorists had got to back-up the benzol producers, and not always be grumbling about the price. If the benzol producers disappeared, there was no one to stand between the motorists and the tender mercies of the petrol companies. He was not there to make any revelation with regard to the price of benzol; they intended to treat this in a business-like way. And when the motoring public had dealt with them for some little time, he felt sure they would be satisfied with the way they were treated. Benzol, of course, could not supply the total quantity that would be required after the war. He supposed at the present moment 200 million gallons of motor spirit were needed annually. The benzol production of the country at the moment was about 40 million gallons as a maximum; but if they got encouragement, there was no doubt they might possibly exceed this quantity. The question was largely influenced by the amount of benzol produced by gas undertakings; and about this he was unable to give any definite information on this occasion. It seemed to those in the gas industry pretty clear as to how it should be dealt with. Benzol was most valuable as a motor spirit; and it really did not much affect the calorific power of the gas—not more than by about 5 p.ct. He asked

whether 5 p.ct. was of such paramount importance that the country should be deprived of the great native produced motor spirit. He said emphatically that the benzol ought to be taken out of gas. He hoped the local authorities would see that the interests of the nation were even greater possibly than those of their own particular towns, and that they would be prepared to give gas undertakings a little time, because he believed arrangements could be made with regard to the gas of the future which would allow the benzol to be taken out, and, if necessary, some enrichment be made (if prices allowed) from another source. It was of paramount importance that this new industry should be preserved in the national interests. He was glad to see that the announcement he had made, that the benzol industry was going to market its own product, met with the approval of those present. He believed this was in the interests not only of benzol, but of the country. A much debated point was that the Government had given the assurance that they did not propose to put the excise tax on benzol. How could they do so if they wanted a young industry to struggle into life? The industry was faced with an enormous expenditure on distribution and in other ways; and how could anyone expect a new industry to arise in this country to compete with the existing occupants of the field with a sixpenny excise duty upon it? It would have been impossible. He was glad the Government had given the assurance they had done. He had much pleasure in proposing "The Health of the Visitors," coupled with the names of Sir Evan Jones, Mr. Shrapnell-Smith, Sir William Keith Price, Major Stenson Cooke, and Mr. S. Henshaw.

The Dye Industry and Benzol.

Sir EVAN JONES, Bart., M.P., congratulated the Association upon its formation, which he had no hesitation in saying was an event of supreme national importance; and he hoped it would turn out an event of equal importance to the interests of the benzol producers. Among new industries, in the interests of the nation, he could not imagine one which would have equal importance to-day as one dealing with the production of oil fuel. They had been for many years more or less dependent upon imported fuel for the transport needs of the country. Without depreciating in any way the great service which the importers had rendered to the country, he thought he could say with equal certainty that the event which he hoped was going to result in the production of a real home-produced oil fuel would not in any way militate against the gratitude they owed to these people, but would, on the other hand, probably indirectly benefit them, without in the least derogating or reducing the interests of the nation, by having a home-produced oil fuel at its own command. He was a motorist, and knew what it was to be in the hands of a monopoly. [Hear, hear.] However, he was more particularly concerned with matters he had to deal with in connection with a Government Department—not entirely with the importance of benzol from the transport point of view, but from the industrial point of view, because one of the greatest industries of the country depended upon the production of home-produced benzol—he hoped, at a reasonably moderate price. One of the greatest of the several exporting industries of this country was the textile, which he thought ranked second in value—amounting to something like 220 millions sterling before the war—to the whole of the exports of the country. This great trade depended entirely upon a comparatively small quantity of dyes. The total imports of dyes into the country in 1913 was only about 2 millions sterling; but they were the absolute base rock of an export trade of the value of 220 millions! Benzol was the base product from which the dyes were made; and therefore it was of most vital importance to the country that it should be produced. The benzol required for maintaining this enormous trade was not great in quantity compared with the total consumption of benzol for transport purposes. The consumption of benzol for dye purposes represented something between 15,000 and 20,000 tons; while the total production of benzol in the country was somewhere about 100,000 tons, which corresponded with the figure of 40 million gallons which the Chairman had mentioned. It was hoped that within the next few years the benzol requirements of the dye trade in this country would be at least three times what they were at present. He referred to the value of co-operation among allied industries; and, in conclusion, he wished the Association great prosperity, and the benzol trade great development. He hoped the Association would succeed in establishing the trade upon a basis which would make it one of the important national assets.

Unite with Other Organizations.

Mr. J. WOOLCOCK ventured to suggest that the National Benzol Association would not be able to bring pressure to bear so well by standing alone as if combined with other Associations. He thought it should be linked-up in some way with others handling (say) chemical products. As the scheme developed, the Association might find it possible in some way to become united with such bodies as the Association of Chemical Manufacturers and the Federation of British Industries. He hoped the Association would go forward with great success.

Suggested Participation of the Motoring Interests in the Distribution Company.

Mr. E. S. SHRAPNELL-SMITH, C.B.E., Chairman of the Standing Committee on Mechanical Transport, said everybody interested in road transport would have heard with the deepest interest and gratification the announcement that the benzol producers were going to undertake their own distribution. It was not for him to guess the capital of the Company that was about to be formed among them to undertake this work. But he might assume, from his knowledge of the subject, that they would be ill-advised if they attempted to do this under a capitalization of £300,000. [A VOICE: £500,000.] Somebody down the room said £500,000. He was coming to the point that they would be well-advised to make it £500,000, and to ask the recognized motoring interests of this country to place before their members the opportunity of participating in the capitalization of the Company. He believed the co-operation of the different classes of motorists in the country—not least the heavy transport section—would tend to build-up a community of interests. The partial coalition would result in a continuity of unity of interest which would be very beneficial to everybody. He believed the extension of the capital of the Company by £200,000 would be snapped-up by the motoring interests, with the intention of standing behind the Association in their programme of dealing with their own distribution. The pulling together of the producer and the consumer should, in his opinion, have far-reaching results.

Benzol and Alcohol.

He ventured to think that benzol was a "key" industry from the point of view of transport. Benzol possessed the unique chemical quality of being able to mix with both alcohol and paraffins. Therefore, they had in benzol a "key" product. He happened to know that the future of alcohol motor fuel in this country was closely linked with the preservation of a considerable output of benzol. A large-scale experiment on alcohol fuel was, within a few weeks, to be made in London under Government auspices. Duty-free alcohol had been liberated in order to allow twenty motor omnibuses to run on this fuel. But for the provision of benzol—say, 25 p.ct., or thereabouts—the experiment would not have been possible, because, with the ordinary type of internal combustion engine, alcohol was not capable of being used without admixture with benzol. With 30 million gallons of benzol, they could put on the market by admixture with other fuels something like 150 million gallons. Regarding the new Association, he believed that it had been well established, was well-directed, and would stand. Its reward would be found in the improved transport conditions of the country, which were closely wrapped-up with a large volume of home-produced fuel.

Continued Benzol Production a Matter of National Protection.

Sir W. KEITH PRICE said he would put in a plea for benzol on the ground that it was a matter of national importance that its production should be encouraged in every way possible, in case an emergency again arose. It was vital to the national interests. It was no secret that the whole of the Allies' explosive programme depended entirely upon the benzol produced in this country. It was a factor which must not be overlooked. His own view was that the production of benzol would be increased very largely indeed. He expected to see it doubled in ten years; he would be disappointed if it were not. At any rate, the commercial prospect was such that he quite anticipated they would see a large increase in production in a reasonable period. He used benzol for his own cars; and he advised everybody to do the same. It was much cheaper; and his cars ran better on it.

The Resources of the "A.A." to be Brought to Bear.

Major STENSON COOKE (Automobile Association) remarked that organized motoring knew what it wanted; and they did not expect anything for nothing. The National Benzol Association was assured of a great future. The motoring interests accepted the Association as a body of serious business men, leavened pleasantly with national pride. Let the Association's motto be: "British benzol for British motorists in Britain," and motorists would be with them. They had discussed the vexed question of price. It was a very difficult question. Times were difficult, and the outlook unsettled. They would accept the Association's sporting suggestion. They would waive the question of price, and would cross the bridge when they came to it. The standard specification for benzol was a sound one. Benzol of the standard would suit ninety-nine cars out of a hundred. They only asked that the producers should conform to it. They would now abandon fair speech, and let pious resolutions go by the board, and would proceed to do things with and for the Association. For British benzol to be exported while motor spirit was imported was a national calamity. For millions of tons of coal to be carbonized by the gas undertakings, and for the gas not to be scrubbed, was sheer insanity. The motorists would help the Association to cure this insanity; and he spoke as the servant of the Automobile Association, and therefore for 100,000 motorists. They would encourage their members to buy British benzol, through the local "A.A." agents and retailers. They would also work untiringly to educate British motorists to use benzol. They would do these things to the fullest extent of the "A.A." resources; and they would do it now.

From the Technical Point of View.

Mr. S. HENSHAW (Staffordshire Chemical Company, 1917, Ltd.), said he had been producing benzol practically all his life, and was responsible for a very big make. Naturally therefore he took a great deal of interest in it. The Chairman had asked him to propose "The Health of the Benzol Industry." It had been suggested tentatively that they ought to produce benzol and supply it at 1s. a gallon. He could not subscribe to this; but benzol producers did feel that, if the motor users and the organizations connected with motoring, would give them fair play, they would be able to produce benzol at a reasonable figure and of good quality. The benzol position was a very curious one. What happened to 30 million or so gallons of benzol before the war? The bulk of it went into gas-works to enrich gas; but now, instead of using it, gas-works were producing it, and so adding to the bulk. The resources of the country were very great; and if the producers got a fair chance, there was no doubt the output of benzol ought to be doubled in ten years. At the present time, they were using, in their fires at home and in factory furnaces, a wonderfully rich coal, possessing tremendous potentialities in bye-products. If fair prices were given for the benzol, and they were assisted by the Government, the development in prospect would take place; and the coal resources of the country would be used in better fashion than had been the case up to this point. Before the war, during 1913 and early in 1914, petrol was selling at about 1s. 7d. a gallon; and benzol producers were getting 1s. 3d. He did not know why they were selling benzol below petrol. He was a coke-oven benzol producer, and connected with a refining establishment. When they were selling benzol at round about 1s. 3d. per gallon, they were paying for coal 8s. per ton. They were now paying for the same coal (but he questioned if it was of such good quality) 22s. per ton. Just consider this for a minute. Nearly three times the cost of coal. They had to pay three times the price for stores and materials used in manufacture, and over twice the amount in wages. They formerly paid semi-skilled men about 35s. per week; and now they were getting £4 and over. How could they produce benzol

at anything like the same price? As to quality, the time when benzol was condemned on this account had gone by for ever. He thanked Sir Keith Price and his Department for a good deal of the improvement. The Ministry of Munitions put them on such a basis that they had to turn out a good benzol for the Department; and they had no difficulty at all now in meeting the Association's specification [see "JOURNAL" for Feb. 18, p. 322].

Mr. R. D. F. PAUL ("Motor") proposed the toast of "The Chairman." He also was glad benzol was not going to be put under the control of any petrol monopoly. The benzol interests were in very good hands; and it was the duty of motorists to push benzol as an alternative fuel.

CO-PARTNERSHIP IN DISTRIBUTION.

The CHAIRMAN said they had had a very interesting gathering, and the benefit of a great deal of practical advice, which would not be lost upon the Committee of the Association. One of the most interesting suggestions was made by Mr. Shrapnell-Smith, that opportunity should be given to the motoring industry to come in, and help to finance benzol distribution. The suggestion would receive earnest consideration. He (the Chairman) thought it a most helpful idea. There was nothing like having a financial interest in any proposition. By this means they would be able to secure a co-partnership which would be highly serviceable. It had been a great pleasure to the Committee and himself to meet their guests.

ELECTRICITY SUPPLY MEMORANDA.

THE electricity supply industry is getting alarmed over the position in which it is apparently proposed to place it by the Government. So long as electricity stood by itself, and there was a prospect of the Government fostering it, and giving it preferential financial assistance and privileges, the men of the industry congratulated themselves and were grateful. But things have not been going quite as was desired. The proposal to establish a Ministry of Ways and Communications, and in connection with it making the electricity industry a sort of appendix, is not a plan that meets with its approval. It wanted something all of its own—an *ad hoc* creation, without any great amount of domination, which would look faithfully after the interests of the industry, and no other. The Incorporated Municipal Electrical Association have passed a resolution, which states that they view with great concern the suggestion to put the industry under the proposed Ministry of Ways and Communications. Electricity supplies to collieries, factories, commercial users generally, and other consumers preponderate largely, it is pointed out, over supplies to railways and to other undertakings coming under the control of the suggested Ministry of Ways and Communications; and it is feared that such control would be exercised in the interests of transportation, to the detriment of the larger interests involved in the general supply of electrical energy. In other words, it is felt that the proposal will result in making electricity supply subservient to other interests—such as those of the railways and other forms of transport—and would further delay the putting into practice of the progressive electrical movement in the national interests. The matter is regarded as most important and not less urgent, and so the Council of the Incorporated Municipal Electrical Association desire that every electricity owning local authority in the country should consider its resolution, and move in the matter of getting the support of its local members of Parliament when the question comes before the House. The industry wants its own Electricity Commissioners and independent department, but to come at the rear of "Ways and Communications" is more than the dignity of electricity can tolerate.

At the Tail of Ways and Communications.

But the industry will have to get to work quickly to instruct members of Parliament as to what they should do in securing the removal of electricity from the control of the proposed new Ministry, because last Wednesday the Home Secretary (Mr. Shortt) introduced the Bill to create the Ministry that is to be entrusted with the control of all our inland transport, including (it is suggested) roads and electricity, though the last-named is to be honoured by having a Bill on its own account. The electricity industry will be disappointed to find that the Government have already decided that their intention to make electricity an auxiliary to their gigantic transport plans is the proper course; so that the idea of the electricity people, that electricity deserves a department of its own, does not agree with that of the Government. The same with roads. Mr. Joynson-Hicks declared, on the first reading of the Bill, that there is a substantial body of opinion unfavourable to roads coming under the domination of the new Ministry, and that it is thought better that the moribund Road Board should be revived, and roads have a Ministry of their own. We shall get to unwieldy government in this way. There is, for instance, no reason why the gas industry should not have a department of its own, and someone sitting on the Front Bench in the House prosecuting the interests of the industry as being one of the great assets of the country. For there is no denying that, through its treatment of coal, and the production of the numerous derivatives that it places in the possession of the nation, it is a "key" or "pivotal" industry of the very first order. However, on the subject of the inclusion of electricity in the Ministry of Ways and Communications, Mr. Shortt anticipates that there will be a considerable difference of opinion. His anticipation, we think, will be fully realized.

The Bill Introduced.

The Case for Inclusion.

What is the Government's case for electricity being included in the Ministry of Ways and Communications? We have only as yet the merest outline. And it is briefly that transport is probably the most important customer of electricity, and so it is important that the new Ministry should have the control of electricity. The Government have learned that in some quarters it is thought that the interest of the railways and of the tramways is not that of the general electricity consumer. The Government has, before hearing the other side, made up its mind that this is not the case. Their view is that electricity is essential to the development of both transport and industry; and therefore the interests in the matter of transport and industry are reciprocal. The Government are proceeding as though electricity is the only source of energy; and that it is the best applicable for all power purposes. This is their line of argument: The more industries are enabled to increase their output, the more prosperous they will become, and the more transport will prosper. The power costs of industry, however, are only a fraction of their total costs—they are relatively small to those for labour; and it is doubtful whether any little difference (if really there will be any) in the power costs of manufacturers will do anything much to advance industrial prosperity. The Government are not at all sure that their schemes of electricity generation and distribution are going to work out more economically than the largest of the existing well-placed central generating stations. Many experts have their doubts, and for very good reasons. However, the Government, in a beautiful visionary way, think that, as the prosperity which electricity will confer upon industry is going to bring prosperity to the railways and other means of transport, those who control the railways will see to it that everyone who can improve his business by the use of power is enabled to get it as cheaply and easily as possible. This is all right. But just to show that they wish to follow practical lines, and be sure they are not pursuing a will-o'-the-wisp, they might inquire into the position of those manufacturers who are generating electricity for power at a rate cheaper than central stations can supply them; and they might also ascertain whether, under certain conditions of use, other sources of energy are not cheaper and more serviceable than electricity. If they are, then they are doing just what the Government requires—contributing to the prosperity of industry, and so to the prosperity of transport. But someone has been priming Mr. Shortt on the subject of load factor, and its influence upon electricity costs. It is an essential point, but must not be overrated. It is evident, however, Mr. Shortt does not know much about load factor. If he had done so, he would have dropped another word or two in the following statement: "If the railways were able to establish a load factor, they would enable themselves to use electricity on the railways more efficiently and far more cheaply, and to a far greater extent even than at present." Of course, they will be able to establish a load factor; but load factor is a question of degree. A small private generating plant in a factory may have a very high load factor, and nothing much to bear in the way of distribution expenses and losses. If the Government bases all these big industrial problems on such lean knowledge as is disclosed in dealing with this matter of electricity, they are proceeding blindly. Well may the electricity industry tremble.

Empty Talk and Material Matters.

If a gas man calls attention to electrical inaccuracies or protests against any preferential treatment being accorded by the Government to the electricity supply industry, according to that student of human nature, "Electrical Industries," such action shows increasing anxiety, jealousy, or pessimism on the part of the gas interests. It is easy enough to say such things. What the electrical critics fail to do is to deal fairly and squarely with the material matters which are put forward on behalf of the gas industry. Our contemporary quotes from the recent address of the Governor (Mr. D. Milne Watson) to the proprietors of the Gas Light and Coke Company. "Exaggerated claims," he said, "are being put forward for electricity." Is this true, or is it not? "Electrical Industries" would take a more virile part if it showed whether or not the claims were exaggerated, instead of indulging in such effeminate nonsense as accusing the gas industry of jealousy. Only the other day Mr. Robert Smillie was telling the Prime Minister that at the present time coal is used in ways which only give some 10 to 15 p.ct. of its thermal value. There is not an electric station in the country that can show a 15 p.ct. efficiency from the use of coal. The average is between 5 and 6 p.ct.; while in the products that the gas-making system obtains from coal only a small part of the thermal value of the coal is lost, and this is compensated for by products which have great value to the community for purposes other than heating. Our contemporary says the public will hardly care to sacrifice convenience and health on the doubtful assumption that a little more or less coal will be saved. Would the writer of generalities just explicitly explain what he means when he refers to "health," and will he please put into figures what he regards as a "little more or less coal?" Then again is the gas industry doing something which only shows petty jealousy when it protests against the Government giving a competing

industry financial support to its disadvantage. Suppose the boot were on the other leg, and the Government were proposing to assist the gas industry in like manner, there would be a torrent of electrical denunciation of a very keen order. If our friend of "Electrical Industries" cares to tackle these matters in more precise terms, he will find there is something more substantial in the gas industry's attitude than petty jealousy and pessimism.

The Chief Burden of Publicity.

The electricity industry seems to be going about its publicity work in a manner somewhat different from the gas industry. The object of such work is primarily to serve two classes of interests—those who supply gas or electricity, and those who supply plant and appliances for producing or utilizing gas or electricity. This being so, the expenses of publicity should fall upon both the suppliers of the gas or electricity and the makers of the producing plant or utilizing appliances. This is the way things are worked in the gas industry. As gas is the largest benefactor through its continuous sale, it bears a greater part of the publicity expenditure than makers of plant and appliances. But it seems that the makers of electrical apparatus are going to bear the brunt of the publicity work of the electrical industry. Anyway it looks much like it, judging from an article in "Electrical Industries." This article was inspired by the search of the Electrical Development Association for a director to organize the work of increasing the public demand for electricity and electrical appliances. It states that the Association (which originated in an Electrical Cooking and Heating Committee suggested by the Institution of Electrical Engineers), while dependent upon the Institution and all other organizations, "derives its main energy from the members of the B.E.A.M.A.; and we may expect that the crucial question of finance will be settled in the first instance by the manufacturers. This is all to the good, as manufacturers have broader ideas and wider experience on publicity than the majority of supply undertakings." We do not think the manufacturers of gas plant and appliances would desire to pay the chief part of the cost of general publicity work, even to win the compliment of being told that they have "broader ideas and wider experience on publicity than the majority of supply undertakings."

EXTERNALLY HEATED OVENS FOR DOMESTIC AND OTHER PURPOSES.

Interesting Wartime Developments by Fletcher, Russell, & Co., Ltd.

The gas industry has played a very large part in the prosecution of the war, and has also materially assisted in the development of trade processes, many of which were not previously carried out in this country. It is, therefore, universally conceded that the use of gas as a fuel will be an important factor in solving many of the problems connected with the reconstruction of the nation's industries.

There are other problems, however, which have been almost equally prominent during the war. One is relating to food, which will undoubtedly attract considerable attention for some time to come. The provision of suitably cooked food for the people will be in the future as in the past, one of the most important items to be considered. Here, again, gas will undoubtedly be very largely utilized, because it cannot be denied that, from the view points of convenience, cleanliness, economy, and the saving of labour, it is pre-eminent as a source of heat for cooking purposes. There are occasions, however, when a prospective consumer of gas for cooking, while readily admitting the truth of this statement, confesses that he or she has a lurking dislike or prejudice against the standard type of a gas cooking stove, with the usual open-top hot-plate and entirely internally heated oven, and cannot be moved from this view, in spite of all arguments advanced to the contrary.

The purpose of this article is to draw attention to a special series of externally heated cooking ranges and ovens, which have been specially designed by Messrs. Fletcher, Russell, & Co., Ltd., to fill all the wants of this class of customer, who, in some cases, would rather not use gas for cooking at all if the type of apparatus he or she favours is not obtainable. We believe this series is unique, including as it does two absolutely new departures in gas-cooking stoves, which, notwithstanding all the difficulties—such as shortage of labour, and restriction on all the principal materials required by gas-stove manufacturers—the firm have succeeded in producing and perfecting during the war. These are the "Langham" range and the "Fletcher" gas-kitchener. The former has been described in the "Journal" on previous occasions; and it is therefore proposed to deal more fully in this article with the gas-kitchener type, as this is the domestic size cooking-stove, and is destined to find a place in well-equipped kitchens of residential households.

The Patented Oven.

The special attachment fitted on the stove makes it possible to use the oven as an ordinary internally heated cooker; and, by the simple depression of a lever, the oven is sealed, and the heat from the gas is applied externally over the base of the oven. Thence it is conducted through special, suitably baffled flues up each side, and then over the crown plate to the flue vent following the accepted principles applied to solid fuel ovens, but obtaining very much better results by reason of the perfect control with which the gas can be regulated. There is no soot or ash to interfere with the smooth working of the flues. It is from this action that the cooker derives its name; being, in fact, a perfect "gas-kitchener." Its advantages over other forms of ovens will be apparent.

In use the oven is lighted internally, assuring rapid heating up, and also an absence of condensation difficulties, which accompany external heating. This rapid heating provides, with a minimum consumption of gas, for all the small services which occur all day and every day outside the preparation for a full hot meal.

When extended cooking is being carried out (after pre-heating internally), the lever is depressed, sealing the oven, and heating goes on externally. The gas consumption can then be reduced to about 10 c.ft. per hour, as this quantity has been found sufficient to maintain a high temperature in the oven for any period. Even after the gas is turned out, milk puddings, &c., will continue cooking for some time, as the temperature falls very slowly on account of the absence of any passage of cold air through the oven.

These are points to be remembered regarding an externally heated sealed oven:

1. The more uniform heating of the oven makes it ideal for pastry and cakes, and in fact all forms of cooking.
2. The small heat loss for the reasons explained above gives a very high efficiency, with small gas consumption.
3. The maximum quantity of the natural juices are retained in the meat, &c., with a minimum loss in weight in the cooking process.
4. Fat spluttering on the sides of the oven is immediately vaporized, and the oven is therefore always clean. This limits the expenditure of labour, which is all important.

The Hot-Plate.

This is provided in solid or open type, just as desired. The open hot-plate is so universal that it needs no comment; but the solid hot-plate is fast finding favour with cooks by reason of its cleanliness. The possibility of packing the whole top surface with utensils, and the ability to keep them all boiling at once is much appreciated. The increasing use of "casserole" cookery will help to popularize the solid-top gas-cooker, as the equal distribution of the heat is essential for satisfactory results; and for simmering or boiling this can be obtained on the solid top with complete success.

We do not think we shall be going far wrong in predicting that this gas-kitchener, which can be used with external or internal heating as desired, will become very popular—particularly when its several virtues are completely appreciated.

The Fusibility of Coal Ash.

An investigation into the fusibility of coal ash and the determination of the softening temperature, has been undertaken by Messrs. Fieldner, Hall, and Feild; and the results are published in Bulletin No. 129 of the United States Bureau of Mines. As a safeguard against excessive clinker troubles, specifications for the purchase of coal can be drawn to include the softening or fusing temperature of the ash. It was, however, realized that the fusibility of a mixture of oxides and silicates such as is comprised in coal ash varies according to the conditions under which tests are made, and that, in the absence of any generally accepted method, no agreement is to be expected among tests made in different laboratories. If, therefore, a fusion-temperature clause is to have any place in specifications for coal, a standard method of testing should be adopted, in order to ensure comparable results by different laboratories, and to obtain the softening or fusing temperature of the ash under conditions similar to those of a fuel-bed. And after a consistent method has been devised for obtaining comparable results, there will remain the correlation of these results with those from the burning of coal in furnaces before the value of fusibility tests in coal specifications can be finally determined. In the Bulletin before us, the literature on the subject is reviewed; and there is given in detail the effect of various oxidizing, reducing, and neutral atmospheres such as are found in various parts of the fuel-bed on the softening temperature of ash when moulded in the form of Seger cones. As a result of this study, a practical method of determining fusibility has been developed, whereby the ash is caused to soften and form slags in which the iron exists in approximately the same state of oxidation as the iron in fuel-bed clinkers. Further investigation is needed to establish the exact relation of these tests to clinker formation; and when this has been carried out, the results will be published in another report.

Exhibition of Davis Furnaces at Manchester.—A series of demonstrations has been arranged in connection with an exhibition of the Davis Furnace Company's industrial furnaces, which is being held in the Whitworth Street premises of the Manchester Corporation Gas Department. The exhibition will remain open until the 14th inst.; and there is opportunity afforded of seeing in action many oven, muffle, melting, and tool-room furnaces. The Davis "Revergen" system—the subject of some of the exhibits and demonstrations—was described in last week's "Journal."

GAS FOR THE HOUSING SCHEMES.

BY THE RICHMOND GAS STOVE AND METER COMPANY, LTD.

Some Suggestions for Consideration with Ascertained Costs.

The gas industry has an important contribution to make to the subject of new housing schemes. Whether regarded from the view-point of the individual housewife, or of the community, gas has a service to render and a work to perform. No other agent can supplant or even rival it in the convenience, efficiency, and monetary-saving it provides in the home, and in the true economic gain it offers to the nation by the abolition of smoke, the saving of transport and other labour, the value of its bye-products, and the conservation of Britain's coal supplies.

This article is written, therefore, to give some details of suitable gas apparatus for housing schemes, to provide information as to comparative costs of installation and running, to draw attention to some factors that demand consideration, in the hope that criticism will be aroused, interest deepened, and possibly other contributions inspired, to the end that, the fullest thought having been given to the subject, gas may be assured of the supremacy that is its due.

The interest of the gas engineer naturally divides itself into four sections: (1) Cooking, (2) Heating, (3) Hot-water supply, (4) Lighting. With the first three of these this article is concerned.

Cooking.

Dealing first with the subject of cooking, this represents little difficulty, as it is almost, if not certainly, a foregone conclusion that every house, wherever there is a gas supply (and we imagine that to outlying estates mains will certainly be run where they do not at present exist) will have a gas cooker fitted. We illustrate in fig. 1 the type of stove which has been used already in large numbers of munition workers' cottages in some of the villages and towns which have, almost magically, sprung up during the war. It possesses many features of interest. The first and most obvious is that, being raised on a stand from the floor, it lessens stooping on the part of the cook; and inspection of the food in

FIG. 1.—RICHMOND'S "BUNGALOW" COOKER WITH ADJUSTABLE STAND AND PATENT PLATE-RACK AND BACK-PLATE.

the oven is more convenient. Further the clear space under the stove offers an inducement to keep the floor clean, and reduces the possibility of floor draughts affecting the proper combustion of the burners, or causing them to fire-back. The (patented) plate-rack and enamelled back plate are rapidly becoming universally used on all gas cookers; and such a convenience as the rack, and such a help to cleanliness as the white back (or splash) plate, should certainly be included in any proposals for cookers for new houses. This type of gas range, produced some years ago, has quickly become popular, and is now made in five sizes suitable for cooking for from four persons up to twenty.

Heating.

Dealing next with the question of heating, it was mentioned recently in the "Journal" that at Roe Green Village (one of the Government housing schemes), a gas point has been run to the parlour fire place to enable the tenants, if they desire, to instal a gas-fire themselves. This practice seems highly desirable; and there is little doubt that advantage would be taken by many tenants of the provision thus made. In view of the comparatively small extra cost that would be entailed while the houses were being carcassed, it should be urged upon local authorities and architects that points should be run also to every bedroom fire-place, so that, if the tenants wish, a gas-fire may be installed at any time. Gas heating is markedly the proper method for bedroom use,

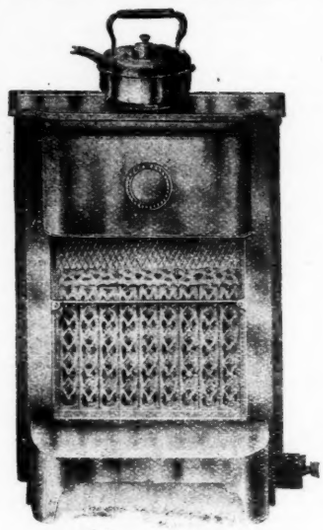


FIG. 2.—POPULAR TYPE OF GAS-FIRE, WITH BOILING BURNER ON TOP.

where the demand is usually only occasional or for sickness. The standard of living is rising, and will continue to rise; and democracy is beginning to discover what it has been denied. The working classes should be given the opportunity, if they desire to avail themselves of it, of some of the modern conveniences of home life. The gas-fire illustrated in fig. 2 is provided with a boiling-burner. All the parts are standardized and interchangeable with other designs in the same series; therefore the maintenance and repair are simple and present no difficulties.

Hot Water Supply for Washing Day and Baths.

We pass from cooking and heating (upon which much more could be said, but which appear to present no particular difficulties) to the subject of hot-water supply, which has not hitherto been such a familiar item of gas supply.

Gas-heated portable coppers are in very wide use; and in the North of England especially, it is the common proceeding to fit them in practically every house. They save labour, and avoid dirt, and rob washing-day of half its terrors. They are low in initial cost, cheap to instal, and, being simple in construction, are not likely to incur expense in maintenance. The boiler should be fitted with a draw-off tap to enable the dirty water to be entirely drained off easily and the interior kept clean and fresh. A water supply tap fitted over the boiler is a convenience much appreciated, a saving of labour and time and a preventative of spilling and splashing of water if it has to be conveyed to the boiler in buckets. This may necessitate a removable lid, instead of a hinged one; and, if so, it should be flat, so that when the boiler is not in use it can be reversed and act as a table for kitchen utensils. The gas consumption may be reckoned at about 30 c. ft. per hour for a 10-gallon boiler—which is the usual size—or (say) 1d. per hour, with gas at 2s. 9d. per 1000 c.ft.

The next important consideration is the supply to the bath. All authorities agree as to the provision of full-sized baths with running hot water on tap. In some cases (*e.g.*, in mining and similar districts), the bath will be placed on the ground floor; but, in other and better-class houses, the bath will be upstairs. In any event, it is strongly urged that the bath shall be partitioned off in a space by itself for the sake of privacy and convenience. Now, where the bath is in the same room or on the same floor-level, and adjacent to the wash-boiler already mentioned, a simple method is to connect the boiler pan to the bath, as shown in fig. 3. This immediately banishes the more complicated and costly hot-water storage system and pipes; and initial installation and running costs are reduced to a minimum. The water for bathing would only be heated when actually required. As 10 gallons of really hot water—say at 150° to 170°—would be sufficient, with the necessary cold water to bring it to the usual

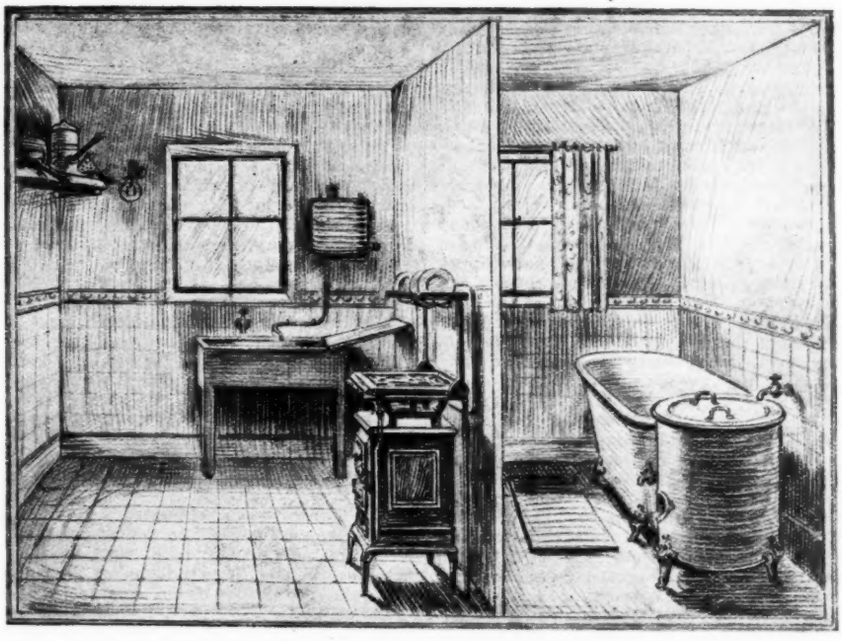


FIG. 3.—WASH-BOILER CONNECTED TO BATH AND AUTOMATIC BOILER OVER SINK.

bathing temperature of 100°, for an average bath, and as the 10 gallons would be heated to the temperature mentioned in an hour, it will be seen, by the figures before quoted, that the cost per bath would be about 1d.

HOT WATER FOR GENERAL HOUSEHOLD PURPOSES.

For the provision of the hot water for washing-up and general house cleaning purposes, it will be noticed by the illustration that a boiler is fitted over the sink. This is entirely automatic in action, a thermostat being fitted which reduces the gas when the water is hot, and raises it again as the water is drawn off. The boiler is absolutely "fool-proof." It is always full of water; the opening of the cold supply cock forcing out the hot water. Being under automatic control, it is extremely economical; and an adequate supply of hot water is always available for immediate use. It is made in four sizes, capacities 2 to 5 gallons; the 2 or 3 gallon sizes being perhaps the most generally useful. From observations taken over a long period in a household of three adults and two children, the fuel consumption may be averaged at 1·25d. per day at the above-mentioned price of gas. This is for providing the whole of the supplies required for household cleaning and washing-up, but not, of course, for bathing, &c.

ALTERNATIVE SYSTEMS AND SOME CONSIDERATIONS.

Where the bath is upstairs, other methods of hot-water supply must be considered, and alternatives can be offered as follows:

A. A geyser in the bathroom and a boiler (as before described) for sink supplies.
B. The instantaneous multi-point geyser supplying bath, lavatory basin, and scullery sink.
C. The gas-heated boiler, with storage cylinder on the usual circulating system.

Comparing these three systems, there are four factors which have to be taken into consideration in each case:

(1) Initial cost of apparatus and of installation.
(2) Running cost of gas consumption.
(3) Convenience in use.
(4) Lifetime of apparatus and cost of maintenance and renewals.

It will be found that all these methods possess some advantages in the above respects, over the other methods. It is intended to state the case for each as fully as available information permits; and it must then be left for conclusions to be drawn, which will doubtless be affected to some extent by the peculiar circumstances of the locality where the apparatus is to be fitted.

A. GEYSER IN BATHROOM AND AUTOMATICALLY CONTROLLED BOILER FOR SCULLERY SINK.

(1) *Initial Cost of Apparatus and Installation.*—In all the costs we shall give we shall assume, as will probably be the case, that a circulating system, with cylinder, will be installed in any event; so that in cold weather, when the fire is lit for warmth, it will also provide or assist to provide the hot water.

For this first method two separate pieces of apparatus will be required—viz., the geyser and the sink boiler. The gas supply to the geyser should come direct from the meter in a pipe not less than $\frac{5}{8}$-in. inside diameter, to ensure an always adequate quantity and pressure—say, a 40-ft. run. For the water supply a short length of $\frac{1}{2}$-in. pipe to connect to existing hot water at the bath. Then there would be flue piping, a draught screen or baffle, probably a cowl, gas and water taps, pipe hooks, and sundries. For the sink boiler, the gas supply would be brought from the nearest point—say, 8 ft. of $\frac{3}{8}$ in. pipe. The water supply pipe

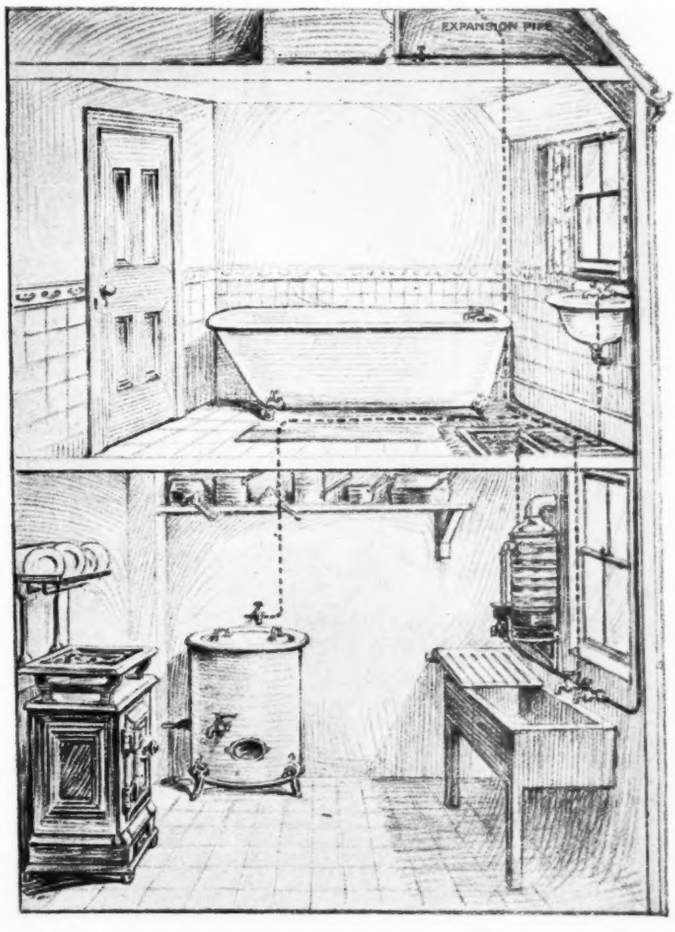


FIG. 4.—INSTANTANEOUS MULTI-POINT GEYSER AS DESCRIBED IN SCHEME B, WITH WASH-BOILER.

would be very short, as it is branched into the hot water pipe at the sink immediately adjacent—one ¾ in. gas, and one ⅜-in. water cocks and sundries.

It is difficult to give figures without knowing the actual design of house; but, as a rough estimate, the cost of the two pieces of apparatus, materials, and labour for fitting, *plus* overhead charges, would come to about £17 5s. It must also be borne in mind that a larger meter would be required, because of the geyser consumption, than would ordinarily be fitted in the house.

(2) *Running Cost of Gas Consumption.*—As may be expected, this method shows the lowest cost of consumption. The efficiency of a geyser is the highest of any form of water-heater, and the gas is burnt only when water is actually drawn off. There is no storage quantity to heat; there is no loss in radiation from a circulating system. The sink boiler is automatically controlled by a thermostat; the small body of water is quickly heated; and gas is speedily reduced to a flame the size of a pea at each jet.

The result of a test made under ordinary domestic conditions in 1915, when the gas in the district sold at 2s. 6d. per 1000 c.ft., gave the weekly cost for this method as 1s. 7½d. Full particulars of this and the other tests mentioned can on request be supplied by the authors. The household consisted of three adults and two children; and an average of fourteen baths per week were taken (this household being great believers in hot bathing!). The geyser had an outflow of two gallons per minute; and the sink boiler with a capacity of three gallons was alight for about 14 hours per day. The test lasted for three months—January to March—the coldest period of the year. The geyser and the boiler were connected to the existing hot water supplies in both cases; and while the kitchen range was never lit expressly for the purpose of providing hot water, it was used occasionally as required to burn rubbish and to air clothes. The geyser and boiler therefore on these occasions received the benefit of the warmed water. This method of installation is the correct one to use where a fire grate with boiler is installed; but where coal is entirely banished, there would naturally be a slight addition to the above cost of consumption. Incidentally, it may be of interest to state that, during the test, gas was used exclusively for cooking and lighting; and for the same period the average weekly consumption for these services was 1125 c.ft., or, with gas at 2s. 6d. per 1000 c.ft., 2s. 10d. per week.

(3) *Convenience in Use.*—The geyser provides instantaneous supplies of hot water, at any hour of the day or night, without any waiting. The sink boiler ensures the housewife an ever-ready supply of scalding water for her general household requirements; and she has no worry about adjusting the gas, nor any fear of the gas wasting if she is busy on other duties.

(4) *Lifetime of Apparatus and Maintenance.*—Geysers being constructed principally of copper (some patterns with cast-iron base and water-container, which adds considerably to their longevity), and the gas consumption being high and the heat consequently fierce, their life term is naturally not so great as water-heaters (*e.g.* circulators) constructed mainly of iron. This factor is mitigated in importance by the construction of modern types, in which the parts receiving the heaviest wear are easily removable and replaceable at a moderate cost. In some districts, the possible effects of incrustation and sediment from the water must be considered, though here again modern geysers have facilities for ready cleaning. The geyser recommended is constructed with vertical water surfaces, which, together with the "flushing" action of the continuously flowing water nullifies the effect to be expected from hard water.

B. Instantaneous Multi-Point Geyser supplying Bath, Lavatory Basin, and Scullery Sink.—See fig. 4.

(1) *Initial Cost of Apparatus and Installation.*—As in the case of the geyser in the bathroom, it will be necessary to run a ¾-in. gas supply direct from the meter—say, a 30-ft. run. The water supply (½-in.) will be run in conjunction with the circulating system. Flue-pipe, taps, &c., will be wanted precisely as for the foregoing example. Again a very rough estimate works out, for the apparatus itself, the fitting-up, including all materials and labour, to £20 10s. The larger meter, as mentioned above, would again be necessary.

(2) *Running Cost of Gas Consumption.*—This method possesses all the advantages previously described of the geyser—viz., high efficiency, gas only burning when hot water is used, and no storage to heat or to lose heat by radiation. There is a little more loss of heat than with a bath geyser, owing to the transmission losses through the pipes.

A test made in a different household, but under similar conditions to the foregoing, with the multi-point geyser similarly fitted to the existing hot-water system, gave the figure of the weekly gas consumption for all hot water used (scullery, washing-up, house cleaning, bathing, &c.) of 700 c.ft. or, with gas at 2s. 6d. per 1000 c.ft., 1s. 9d. per week. The family was of the same size—viz., five persons; but in this case only an average of seven-and-a-half baths were taken per week. The test extended from October to December, 1915.

(3) *Convenience in Use.*—This method requires no attention at all. Hot water is always instantly available. The opening of any tap automatically raises the gas; the closing of the tap again shuts off the gas at once to a tiny bye-pass. No gas can be wasted; none can be consumed except when actually required.

(4) *Lifetime and Maintenance.*—The above remarks under this heading as regards the bath geyser apply equally to this apparatus. But with slight additional force, it must be added, owing to the necessary automatic valves for lowering and raising the gas, which, though perfectly simple, should be periodically inspected.

C. Boiler on Usual Circulating System, with Storage Cylinder.

(1) *Cost of Installation.*—The gas supply would be best taken direct from the meter (although not absolutely necessary where pipes of a good size have been run to the scullery)—say, 30 ft. of ¾-in. The circulating pipes from the boiler would be carried direct to the cylinder which it has been assumed would be in a room immediately above the boiler (or preferably in the same room, as in the illustration). Flue piping, taps, sundry fittings, &c., will be needed.

As an approximate figure, it may be taken that the cost of the boiler, *plus* its installation, materials, and labour, including a margin for overhead expenses, would be £10 15s. This would include a stand, on which to place the boiler, but does not include the cylinder, for reasons mentioned under Example A; this being in any event assumed to be included by the builder with the circulating system from the coal grate.

(2) *Running Cost.*—It will be anticipated that this system shows a somewhat higher cost of consumption than either of the foregoing, chiefly owing to loss of heat by radiation from the cylinder and pipes. These losses can be materially reduced, and the efficiency heightened, by lagging the cylinder with insulating material, and by the boiler and cylinder being in the scullery (and therefore near the sink tap) and immediately underneath the bath-room. If the pipes to draw-off points could not exceed about 6 ft. to bath and hand-basin, and 6 ft. to scullery sink, it would be a distinct advantage; but whether architects can be persuaded to provide this convenience must be a matter for local attention. The type of installation in fig. 5, with cylinder combined with the boiler on one stand, shows naturally a much higher efficiency than fixing the boiler on the ground floor and the storage cylinder on the first floor.

Once more we turn to actual figures. A test, ranging

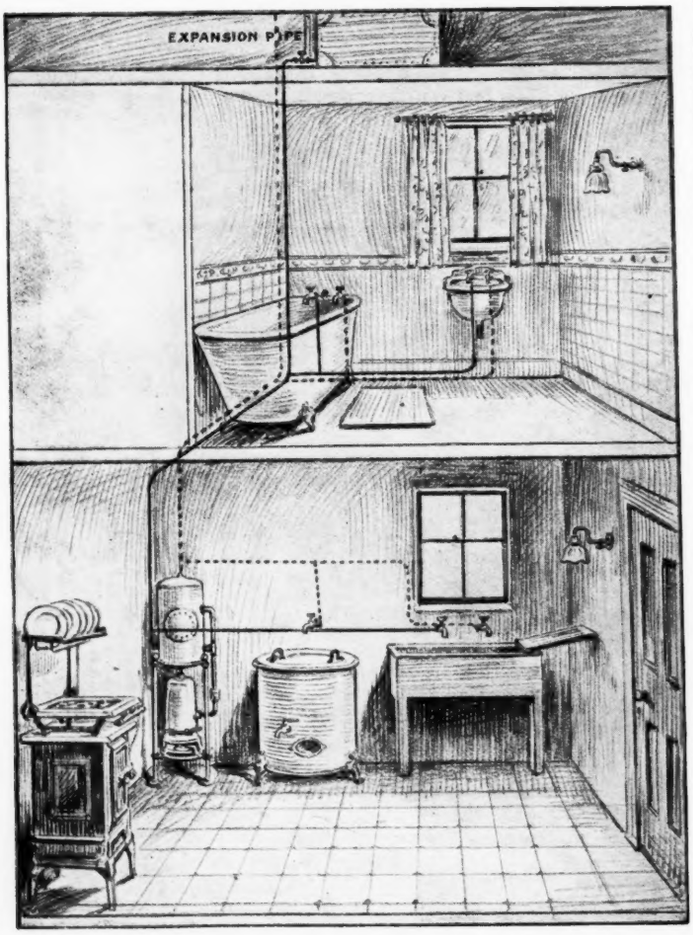


FIG. 5.—COMBINATION CIRCULATING BOILER AND STORAGE TANK AS DESCRIBED IN SCHEME C, WITH WASH-BOILER.

over a complete year, was made in a household of five persons, and all the hot water required for every use was provided by the gas-boiler. The consumption, checked by a separate meter, was 58,400 c.ft. for a year, or 1122 c.ft., which means (say) 2s. 9½d. per week. An average of two hot baths were taken per day; and the gas boiler, being connected to the existing hot-water system, received the benefit of the warmed water when the kitchen range was lighted occasionally to burn rubbish and to air clothes. All cooking was done by gas. It should be specially noted that in all these tests the kitchen range was never expressly lit either for providing hot water or for assisting the gas-boiler. The coal fire was lit spasmodically for the purposes above mentioned, and entirely without regard to any effect on the hot water supply.

Now in actual practice, where a coal fire was present, it would naturally, during the cold weather, be used for providing hot water, and the gas-boiler would be cut off. To this extent, therefore, the gas consumption figures given above would be reduced. It must also be remembered that—as this would occur most often in the winter months, when the general warmth of the fire would be appreciated in the room, and when the temperature of the cold water was at its lowest—a very big saving in gas on the above figures can be reasonably anticipated.

(3) *Convenience in Use.*—This method in practice is, of course, similar to that with which everyone is now perfectly familiar—viz., the circulating system with the boiler fitted behind the kitchen range, excepting that there is no uncertainty as to whether the fire will light or whether it will draw properly! Hot water is not available immediately one arises in the morning—sufficient time must be allowed to heat-up the water (or part of it) in the cylinder. It is easy, however, to calculate the time this will occupy, and arrange baths and other requirements accordingly. Once the cylinder is full of hot water, then, with ordinary requirements, scalding water will always be available without waiting. When the water is only wanted for scullery purposes, &c., this period of waiting is reduced to an almost negligible time by the "cut-out" valve, which virtually reduces the capacity of the cylinder to 5 or 3 gallons. The gas boiler heats this quantity in a few minutes; and so long as baths are not required, it will be ample for all general household purposes. When a larger supply of hot water is wanted, the valve is opened to bring the whole contents of the cylinder into circulation.

The automatic thermostat ensures the economy of the gas consumption. Therefore the gas requires no attention—regulating itself to the demand for hot water.

(4) *Lifetime and Maintenance.*—The boiler is constructed entirely of cast iron, with a mild steel inner cone forming the flue way. It is, therefore, practically indestructible and everlasting. There is nothing to get out of order, and nothing likely to require replacement. It is ideal from the view-point of the maintenance department.

The foregoing points of the three systems are summarized in the accompanying table.

The British Association Fuel Economy Committee (1916) estimated that 36 million tons of coal are burnt annually in the United Kingdom for domestic purposes; and to the extent that an unnecessary quantity of fuel is used to obtain the desired heat, there is national waste. Supposing these 36 million tons of coal were carbonized in the gas-works of the country, we should have (at an average of 12,500 c.ft. of gas per ton) 450,000 million c.ft. of gas. We should also have nearly 20 million tons of coke. Then we should produce some 10 to 11 gallons of tar per ton of coal carbonized, and realize in this way about 400 million gallons of tar. In addition to this, there would be produced (say) 28 lbs. of sulphate of ammonia per ton of coal carbonized, or a total of 450,000 tons of this valuable fertilizer. These calculations, as will be apparent, are based on the result that would be obtained from an equal weight of gas-making coal; and it is not suggested that the whole of the classes of coal used in our houses would give equal returns. Nor should it be understood that it is supposed that the whole of the coal consumed for domestic purposes—extravagant as nearly all such consumption undoubtedly is—could be displaced. But a large part of it undoubtedly could be put to better use. The figures arouse one's thoughts, and demonstrate the amount of waste that is incurred by so large a use of raw coal. The householders of the United Kingdom consume, in the aggregate, more coal than the iron and steel industries; nearly as much as mines and gas-works together; and three times as much as railways.

In our data we have not taken into account the distillation of the tar, which provides oils, aniline dyes, manifold chemical products, benzene, toluol, &c. To destroy these valuable and rich commodities by the crude use of coal is emphatically a national loss—a loss that is accentuated when we consider the unnecessary employment of the labour and horse and other vehicles engaged in the distribution of coal, which contributes its quota to the wear and tear of roads. These facts, if presented in an appropriate manner, should readily gain adherents to the cause of the scientific and economic use of our remaining stock of unmined coal. We have an unrivalled claim to make; we are engaged in one of the greatest industries of the day, and one that has been of the highest service to the public.

Take, finally, the question of Smoke Abatement, and consider the material aid that gas provides towards the solution of this great and urgent sanitary problem. The Hon. F. A. Rollo Russell in his "London Fog and Smoke" (1905) estimated that the damage done by smoke in our large cities amounts to a sum equivalent to £1 per head of the population per annum, while other investigations now proceeding suggest that this figure is under-estimated. As it stands, however, it means a loss for cities like Sheffield and Leeds amounting to £500,000 per annum, rising for Liverpool and Glasgow from £800,000 to £1,000,000 per annum.

An attempt might be made to estimate the total saving in this direction that can be achieved by the wider use of gas in the National Housing Scheme. The figure of 300,000 has been given as the number of new houses that are wanted urgently. Incidentally, it may be noted that this huge number will only make up for the diminished building during the war, and bring us back to the average rate of building for the ten years previous to the war. Now it has been computed that the average consumption of a working-class household in the summer, when the coal range is only used for cooking and heating water, is 1 cwt. per week. Taking fifteen weeks as representing the warm period of the year, and 300,000 houses, the coal consumption represents 225,000 tons burnt crudely, with their products wasting their foulness on the city air, all of which could be displaced by gas used for cooking and water heating, and an important contribution would be made towards the solving of the smoke abatement difficulty.

In these ways and others which will immediately suggest themselves to the readers of this article, the National case for gas can be presented, and advantage taken of this unique opportunity to establish the industry more firmly than ever on the sound basis upon which it rests.

A Comparative Summary of Points.

—	A—Geyser in Bath-Room and Boiler at Sink.	B—Multi-Point Geyser.	C—Circulator.
1. Initial cost of apparatus and installation.	£17 5s.	£20 10s.	£10 15s.
2. Running cost per week.	1s. 7½d.	1s. 9d.	2s. 9½d.
3. Convenience in use . .	Bath: Hot water instantaneously. Sink boiler: Continuous supply with automatic control of gas.	Instantaneous supply at all points—gas only burning when hot water is drawn off.	Continuous supply after first heating up, with automatic control of gas.
4. Lifetime and maintenance	Of copper construction; not so durable as C.	Similar to A.	Practically indestructible.

Presenting the Case from the Highest Standpoint.

Before concluding this article, we should like to express the hope that gas engineers and their staffs, in discussing this subject with housing committees and municipal authorities will take advantage of the opportunity to present the case for the use of gas from the very highest standpoint—viz., that of the national interest.

For domestic use, gas has so many unassailable advantages which give it a predominant position over other fuels, that the wider issues involved have hitherto hardly received the emphasis they deserve. This housing campaign will bring us into contact with a large and influential section of the community, the leaders of our civic life, the most important men in our cities, towns, and villages, aldermen, councillors, architects, surveyors, medical officers, builders, &c.; and this opening should be seized to accomplish educational and propaganda work of the very first value. The gas industry rests not only on the convenience and economy it provides in the home, but on the economic gain it brings to the nation; and with all kinds of projects of reconstruction now under consideration, it is highly desirable that the knowledge of the services of the commodity we offer should be as widespread as possible. There is every indication that gas will be used to a very considerable extent in the new housing schemes; but there are many directions in which there is scope for developments—particularly in heating and water supply; and the argument of the economic gain to the nation can usefully be employed to support the argument of the advantages in the home.

Temporary Increase of Charges Act.—An Order has been made by the Local Government Board authorizing the Rickmansworth Urban District Council to increase the maximum price of gas supplied by them from 4s. 7d. per 1000 c.ft. within the district and 5s. beyond, to 5s. per 1000 c.ft. within the district and 5s. 5d. beyond. The Board have received an application for an Order from the Horsham Rural District Council.

PARKINSON'S "NEW COTTAGE" GAS WATER-HEATER.

Small Quantities of Hot Water or Large Quantities of Lower Temperature Water from One Heater.

In all progressive communities, consideration is now being given to the better housing of the working classes. This is one of the chief requirements in the reconstruction work of the country, which is to make for us a New England. Contented workers are necessary; and comfortable surroundings are a great factor in the promotion and maintenance of contentment. "Comfortable surroundings" include the provision of labour-saving arrangements in the home. The workers themselves claim a higher standard of living; and to realize this not only more cleanly and healthy living accommodation is needed, but the provision of the conveniences that make for labour-saving. It would be a reproach to our inventive capabilities if new conveniences and labour-saving appliances were only produced which could come within the reach of the more wealthy, who, through their position, are really in less need of such appliances than those who are not so well-off in this world's goods. That the working classes are desirous of utilizing inventions that promote domestic comfort, and ease the work of household, is well attested by the great popularity of the prepayment gas-meter, the supersession of the old oil-lamp by incandescent gas-burners, the use of the gas-cooker in place of the coal-range, and the gradual installation of a gas-fire in the "parlour." In the "new" England we have to try to get beyond these conveniences; and gas offers the means. Good progress has been made in the houses of the better class in the fitting up of gas-heated water appliances and circulating systems. There must not be stoppage there. Descent has to be made to the poorer class of property; and the new housing schemes provide for this being done. It is therefore up to gas engineers, architects, and, in fact everyone responsible, to see that the necessary provision is made, for hot water is a primary requisite to house and personal cleanliness, and is therefore a companion to fresh air as the chief of hygienic agents. Parkinson's "New Cottage" water-heater has been designed with a view of meeting this new development; and the features which it incorporates should ensure for it a still larger scope of application.

Parkinson s "New Cottage" Water-Heater.

In the provision of gas-heated water arrangements for small-class property there are certain essentials to be considered. On the one hand, they are simplicity of the apparatus, ease of installation, and assured low maintenance cost; on the other hand, range of volume and temperature of water, and money and time economy to the householder.

In most proposals for the use of gas for hot water supply, separate heaters have had to be used for the provision of high temperature water in small quantities for household purposes, and lower temperature water in larger quantities for (say) bath purposes. But the "New Cottage" heater has been designed to serve both purposes, which is an important consideration for the special purposes of the smaller class property, particularly in connection with installation costs, and with the fact that in the smaller class property space is a consideration. Moreover, this dual service by the one heater is obtained without any loss of efficiency, which is a point of advantage to the consumer. There is independence, too, though only one heater is employed, between the small water-heating section and the larger storage, owing to the provision of a valve on the hot water pipe for closing-off the circulation to the larger storage until the lower temperature water is required for bath or other purposes.

At the moment, we cannot describe the construction of the new heater in detail, as it is the subject of a patent application. But it may be mentioned that the boiler has been specially designed with a large heating surface immediately over the gas-burner, and the arrangement is such that the heat from the combustion of the gas travels over the whole surface. Above, and connected with the boiler, is a cylinder or tank, containing the storage of water. Through the cylinder passes a central flue for the products of combustion, from which heat is transmitted to the water in the cylinder. In this way, economy is promoted. As water for washing-up, scrubbing, and other household purposes is so frequently required, the normal condition of the apparatus will be to have the valve closed, so that there will be no circulatory action. A few minutes then suffice to give from 1 to 1½ gallons of nearly boiling water. This is a contributor to economy, as it ensures that no more gas is consumed than for the quantity of water needed—in other words, no B.Th.U. are wasted in heating an unnecessary quantity of water. The importance of this in small households is too obvious to need emphasis. All that has to be done when a larger quantity of lower temperature water is required for the bath or on "washing day" is to open the valve, and 12 to 13 gallons are quickly available.

From this brief description, it will be appreciated that the "New Cottage" heater must be economical and efficient, besides being a highly convenient device for the special purpose it is designed to meet. That it is so, we are satisfied from the results of tests which have been inspected. The figures are convincing and most satisfactory as to time, gas consumption, and efficiency; and our calculations show that (by the addition of cold water) a bath of 20 gallons at a sufficient temperature is put at the disposal of the small householder at the very modest cost of 1d. when the price of gas is even at a figure some pence above that obtaining in pre-war days in many places within the Metropolitan area.

There are other features. The heater can be fitted with a connection for circulation pipes from a boiler behind a coal fire. In this case, when the fire is in use for heating or cooking, the waste heat serves to heat the water; and gas need only be used to supplement it if necessary, while gas alone can be employed when the fire is not alight. Gas, coal, or coke, or a combination of the gaseous and one or other solid fuel may therefore be employed as desired. The heater being small and compact, the minimum of space is occupied. And just as simplicity is a feature of the construction (ensuring low maintenance costs), so is the work of installation; and the householder will find this handy promoter of economy and convenience as simple to use as the gas-cooker—in fact, more so. The "New Cottage" heater will not appeal in vain for patronage. Its many merits will certainly ensure it.

SMOKELESS DOMESTIC FUEL FROM COKE-DUST.

In Place of Anthracite.

A communication to the Société Technique du Gaz, by M. Bachelay, describes the practice which has been developed during the war by the Société des Charbons et Agglomerés du Littoral Méditerranéen of utilizing coal and coke dust in the manufacture of fuel to replace English anthracite in closed combustion stoves and central-heating installations.

The pioneer step in the utilization of coke-dust in this way was taken, according to M. Bachelay, by the Lyons Gas Company, who, in 1882, put down plant at their Perrache works for the daily production of 8000 kilos of briquettes, with the object of dispersing their stocks of coke-dust. The working of the installation was described before the Marseilles Congress of 1883, and is thus claimed to have anticipated by a considerable number of years the utilization of the material in the same way at the Smethwick works in 1916, an account of which appears to have come only lately before M. Bachelay.

The manufacture of the fuel referred to has been carried on since 1915 in a plant designed for the production of coal briquettes for the French navy, and which has, without alteration, been employed for domestic ovoids and for industrial briquettes of the new composition. This composition is: Coke-dust, 77 to 82 p.ct.; fine washings of long-flame coal, 10 to 15 p.ct.; dry pitch, 8 p.ct. The mixture of coke and coal is made in an elevated hopper, whence it passes to an endless band, on which the powdered pitch is distributed in a regular manner, From the band, the mixture is delivered to the first "malaxator," where the components are mixed and a preliminary and partial fusion of the pitch produced by the injection of superheated steam at a temperature of 250° or even 350° C., according to the quality of the materials employed. The mixture is conveyed by an archimedian screw to a second malaxator, where, by the further heating and fusion of the pitch, accompanied by injection of steam, a homogeneous mixture is prepared. The paste is then taken, again by an archimedian screw, either to the briquetting press or to that for the making of ovoid bricks. The approximate composition of the finished material is: Volatile matter other than moisture, 16·6 p.ct.; ash, variable according to the quality of the coke, but not exceeding 22 p.ct.; moisture, 5 p.ct.

The calorific power is 6200 cals., and the strength, measured by the method of the French Admiralty, 60 p.ct. in the case of the briquette and 100 to 110 p.ct. in the case of the ovoid. The quality of the fuel is such that, under the official control of prices during the war, it has been priced at 82 frs. per tonne at the works, as against 55 frs. per tonne for ovoids made from lignite. The price of 82 frs. was fixed at a time when English anthracite sold at 210 frs. per tonne.

M. Bachelay is of the opinion that the project is one which may interest gas makers, who have the necessary plant available, by providing a means for disposing of a product of relatively little value and at the same time of rendering an actual service to the public. He anticipates an extension of the demand when transport facilities have become more or less normal.

LOW-TEMPERATURE CARBONIZATION IN RELATION TO THE PRODUCTION OF MOTOR SPIRIT, FUEL OILS, SMOKELESS FUEL, AND POWER GAS: ITS AIMS AND OBJECTIVES.

By F. D. MARSHALL.

(*Concluded from p.* 385.)

LOW-TEMPERATURE CARBONIZATION.

THE foregoing results have been referred to as being rendered possible by a system of low-temperature carbonization, and it is expedient to explain in detail what the low-temperature conversion or carbonization of bituminous or non-bituminous fuels implies. The expression "low-temperature" is purely a relative one, as distinguished from the temperature employed at gas-works and coke-ovens for the treatment of coal to produce illuminating gas, metallurgical coke, &c. The temperatures which may be termed high employed by gas and coke-oven works, range from 2000° to 2200° Fahr. To maintain this temperature for any length of time, retorts or chambers of fire-clay or other refractory material are essential. These are very costly, and their life is short. On the other hand, the temperature called low ranges from 900° to 1200° Fahr. (an incipient red heat), and the retort employed is of cast iron. Six years of experience have proved these cast-iron retorts to be practically indestructible, and they are cheap to instal. The temperature difference in the two processes is therefore some 1000° Fahr. The results obtained, however, by submitting coal to destructive distillation or carbonization by either of these widely differing temperatures are very notable. An average coal when submitted to a temperature in the retorts of some 2000° to 2200° Fahr. will yield approximately per ton:

Gas, 12,000 to 13,000 c.ft. of approximately 500 B.Th.U.
Coke residue, 66 p.ct.
Tar, 9 to 10 gallons.
Sulphate of ammonia, 20 to 28 lbs.

A coal of similar character submitted to a temperature of 900° to 1000° Fahr. will yield per ton:

Gas, 4000 to 6000 c.ft. of approximately 650 B.Th.U.
Coke, 70 to 75 p.ct.
Tar oils, 18 to 22 gallons.
Sulphate, 15 to 22 lbs.

LOW-TEMPERATURE COKE.

The study of the properties of low-temperature coke residue is very interesting. High temperature gas coke is exceedingly dense, practically devoid of any volatile matter; making it difficult to burn in an open grate except with the assistance of a good draught. For this reason, in normal times, it has never been a popular domestic fuel in this country. On the Continent, however, for consumption in closed slow-combustion stoves, it is eagerly sought after. Hence the large export of coke from the British Isles to the Continent. The density of gas-works coke is not due to pressure, but to the prolonged heating at a very high temperature.

Reference has been previously made to the advisability of converting for industrial purposes low temperature coke into power or producer gas, and at the same time recovering the ammonia; and, *primâ facie*, one would therefore assume that the same gasifying process with ammonia recovery could be applied equally satisfactorily to high-temperature gas-works coke. But this is not so. From trials extending over some long period it has been ascertained that, using gas coke in a producer, a fair volume of gas is obtained; but for some reason the quantity of ammonium sulphate recovered is very low as compared with the amount recovered when low-temperature coke is gasified. The writer has discussed this point with Dr. Mollwo Perkin, Dr. Lessing, and other chemists; and their theory is that, under the excessive temperature to which the gas coke has been submitted in the gas-retort, in some manner the nitrogen has been upset or else displaced, forming other subtle combinations, with the result that very low yields of ammonia are obtained. The writer would welcome any information or discussion on this point.

It has been persistently suggested that low-temperature coke is friable to a degree that renders transport difficult. These statements are made by those who have probably never seen or handled a properly made low-temperature fuel. This point was dwelt on quite recently by Dr. Mollwo Perkin at a meeting; and the writer cannot do better than quote his published statement, which is as follows:

EXTRACT FROM THE DISCUSSION ON A PAPER READ BY MR. E. C. EVANS ON LOW-TEMPERATURE CARBONIZATION. [Reported in the "Journal of the Society of Chemical Industry," July 31, 1918.]

Dr. F. Mollwo Perkin said that low-temperature carbonization work was rather more forward than the paper indicated.

The Tozer retort, in which a vacuum was used, would deal with any class of coal, either caking or non-caking, and it was rarely that he had any trouble in getting coal out. It swelled up quickly, and he thought that the action of the vacuum caused the heat to pass through the coal more rapidly; and it gave a really good fuel. With regard to the friability of smokeless fuel, he had recently had a consignment from the Tozer-Marshall works, which had been three weeks on the railway, in frosty weather, and it only contained about 10 p.ct. breeze; and even this was not wasted, because it could readily be briquetted.

To produce solid, compact, and transportable low-temperature coke, the bituminous coke or cannel (because experience has proved that certain cannels will produce most excellent fuel) must be confined in comparatively narrow chambers, and the walls of the chambers must be stout enough to withstand considerable pressure, which is quite easy to effect in a cast-iron retort of the construction to be described presently. Under a temperature of 900° to 1000° Fahr., a swelling coke will reach its maximum of expansion in about 3½ hours. At this period the pressure on the charge is very great, as may be concluded by observing the polished sides of the coke slabs which have been in contact with the iron retort when withdrawn. By the time the charge is completely burned-off a certain amount of shrinkage has taken place, which ensures easy discharge.

The above conditions ensure the production of a very dense and compact fuel. It may be asked if one carbonizes under such extreme pressure, sufficient to polish the coke, how is it possible to get the gas away? The answer is through the heart of the coke, which is kept open by a rather extreme vacuum as compared with the vacuum employed on a gas-works. The design of the charging and discharging doors are features of the construction of the retort.

Having explained the method by which a dense low-temperature coke is produced, the writer may be permitted to remark that, according to his practical experience, any form of low-temperature carbonization system dealing with a bituminous swelling coal, which does not submit the coke in process of formation to pressure, will produce a porous, friable substance which would not be transportable for any distance without breaking-up.

The qualities of the coke will now be described. At such a low temperature of carbonizing, a certain quantity (varying from 9 to 12 p.ct. of volatile matter) remains in the coke, which makes it easily ignitable and quite easy to burn in an open grate. Its calorific value, compared with good coal, is 13,300 B.Th.U.—coal being 14,200 B.Th.U.; but its radiant heat value is approximately double that of ordinary coal, and it makes a splendid fire. For conversion into power gas with ammonia recovery, it has been proved to be an ideal fuel, easy to gasify with a minimum of labour, and the nitrogen content of it is easily recoverable as ammonia.

LOW-TEMPERATURE GAS.

The gas from ordinary bituminous coal varies in its thermal value from 550 to 650 B.Th.U., and is subjected to the process of stripping by washing with an oil, preferably a middle distillate from the low-temperature tar. The stripping reduces the gas from approximately 550 to 650 B.Th.U. per c.ft. down to 400 to 450 B.Th.U.; and what is absorbed by the oil (which readily parts with it again on distillation) is in the nature of a motor spirit—a paraffinoid with a specific gravity of ·760 to ·800. On an average, the gas stripping yields spirits equivalent to from 1½ to 4 gallons per ton of coal carbonized. The stripped gas is used to heat the retorts, and any surplus can be sold to neighbouring factories, as it is an excellent power and heating gas.

LOW-TEMPERATURE TAR OILS.

The crude oils obtained by low-temperature carbonization of coal, cannel, or lignite are hydrocarbons of the paraffin series as distinct from those derived from gas-works or coke-oven tars, the first distillate of which is benzene (C_6H_6). Incidentally, 90 p.ct. benzol is really crude benzene, 90 p.ct. of which distils below 100° C., and the balance up to 140° C. The term benzol is purely a commercial one, and embraces homologues of the same, such as toluene and xylene. On the Continent, what we term benzol is invariably termed benzene.

But to return to the low-temperature liquid hydrocarbons. These, as far as research has gone, are directly related to the paraffin series, beginning with methane, and are, in consequence, designated as fatty, olefin, or aliphatic hydrocarbons, and consist of carbon atoms arranged in open chains. On the other hand, if the carbon and hydrogen atoms are arranged in cyclic forms or closed rings, they belong to the benzene series, and are termed aromatic hydrocarbons. The question as to whether certain constituents of the two series belong to the saturated or unsaturatep hydrocarbons is a debatable point, notably as regards benzene; but it seems established that the olefins are distinctly of the saturated form [see "Chemistry of Petroleum"—Tinkler and Challenger], since they are incapable of taking up more hydrogen; and this applies to all the paraffin series from methane to solid paraffin. Generally, methane and its homologues are termed paraffins ("parum" little, "affinis" affinity) or paraffinoids, indicating the stability of the substances in the presence of strong acids. Benzene and its homologues are termed benzenoids, and are commercially derived from the high-temperature gas-works and coke-oven tars, and have a most important function to perform,

in being the base of nitro-benzol, used during the war in the manufacture of high explosives, and in times of peace as the basis of the aniline dye industry, and also to provide a good motor fuel.

In describing low-temperature tar oils, Dr. Mollwo Perkin, a keen student of these oils, is probably right in terming them a half-way house between the products of natural petroleum and shale oils. But however stable these low-temperature oils may be as regards the action of acids, the gases which produce them are wonderfully susceptible to temperature variations during their evolution. It was of great interest to learn the point of temperature when they lose their characteristics of olefins and pass over to the benzenoid series or aromatic hydrocarbons; and we are indebted to Dr. Dunstan, late of the East Ham Technical College, for having contributed to this solution. During a series of trials at our works, he established pretty closely that the turning point was approximately 1400° Fahr., or the highest point the cast-iron retorts could comfortably stand. The trials were undertaken at between 1200° and 1300° Fahr., and in Dr. Dunstan's words:

> The present series of experiments were undertaken to increase the yield of the aromatic series; and this could only be done by raising the temperature of distillation, without, however, militating against the excellent nature of the residual smokeless fuel or coke, which is so important a factor in the process, but which Mr. Marshall and Mr. Tozer reported to me at the conclusion of my trials was of very good quality. The tar oils at between 1200° and 1300° Fahr. were heavier than at a lower temperature—being (wet) tar 1·085 at 60° Fahr., and (dry) tar 1·10.
>
> The light oils given off by fractionation at 170° C. gave 19 p.ct. of cresylic acid and 4·7 p.ct. of a combination of benzol and toluol.
>
> Therefore, it was clear to us that if we wished to stick to the process of evolving unadulterated paraffins, yielding good motor spirit, &c., and coke with a fair percentage of flammable gases, it was necessary for us to keep below 1200° Fahr., and not to be tempted to wander into the realms of benzenes and benzenoids, which would only have ended in destroying our retorts and at the best producing an oil of a hybrid character. But it was a most interesting experiment of great value; and it leaves us to wonder what kind of oils the Government (Ministry of Oil Production) obtained from their war emergency scheme, in trying to combine the operations of ordinary high-temperature vertical gas-works retorts for the purpose of obtaining oils and a large quantity of gas at the same time? The gas-making high-temperature zone of the retort would produce benzenes and benzenoids; while the upper portion, or low-temperature zone, would produce paraffins and paraffinoids. As there were no means of separating the gases producing these widely differing classes of oils, it appears to us that they must have obtained a very mixed sample.

It will now be interesting to set out what typical coals yield when they are submitted to low-temperature carbonization at 1000° Fahr. and under; and some of the results of vastly varying, but typical, coals are herewith appended.

To take, however, concrete instances of two widely different types—an ordinary bituminous coal and a medium good cannel—the results were as follows:

Bignell Hill Pearls.

Treated, 5 tons.
Coke=75 p.ct. containing 9 p.ct. flammable gas, very hard and dense.
Crude oils water free=22·0 gallons per ton, sp. gr. 1·060.
Fractions of crude oil.
Ammoniacal liquor, 9 5 p.ct.

Oil 170° C.	6·0 p.ct.	=1·33 gallons	·800 sp. gr.
170°–230° C.	16·5 ,,	=3·66 ,,	·970 ,,
230°–270° C.	9·0 ,,	=1·99 ,,	
270°–350° C.	36·0 ,,	=7·99 ,,	1·04 ,,

Pitch, 23 p.ct.

Note.—The fraction 270° to 350° was pushed to the decomposition stage, and yielded a very fine lubricant.
Ash in coke, 10·3 p.ct.
In addition, the oil from the stripping plant yielded, at 150° C., 2·61 gallons of motor spirit; making a total yield of spirits 3 94 gallons per ton.

Tyne Boghead Cannel (Mickley).

Treated, 5 tons.
Coke=70 p.ct. poor for domestic purposes (20·4 p.ct. of ash) but good for producer gas.
Crude oils=53·5 gallons per ton.
Fractions of oils.
Ammoniacal liquor, 0·5 p.ct.

Oils up to 170° C.	8 o p.ct.	= 4·24 gallons	·780 sp. gr.
170°–230° C.	10·0 ,,	= 5·30 ,,	·832 ,,
230°–270° C.	13·0 ,,	= 6·89 ,,	
over 270° C.	38 o ,,	=21·14 ,,	·886 ,,

The stripping oil yielded, up to 160° C., 4·5 gallons per ton; making the total yield of spirits perton = 8·75 gallons.
The specific gravity of the spirit from the stripping plant was ·796.
Ash in coke, 20·4 p.ct.

It will be noted that both the bituminous coal and cannel oils yielded on fractionation 23 and 29 p.ct. of pitch respectively—less than half the quantity yielded by the fractionation of gas tars. The low temperature pitch is remarkable, too, on account of its plasticity and the low percentage of free carbon which it contains. It has proved itself an excellent electric insulator, and superior for briquetting purposes.

Motor Spirit.

The fraction up to 170° C., combined with the spirit obtained by stripping the gas, has a specific gravity on the average of ·780 to ·800, and has proved, by trials of 300 miles, to be a first-class motor spirit, fully equal to any motor spirit on the market. When properly rectified, it is a water white spirit with an agreeable odour.

Middle Oils.

The fractions from 170° to 230° are excellent fuel and illuminating oils, and of great value for internal combustion oil engines, especially of the Diesel type, as we have proved.

Heavy Oils.

The heavy oils are good lubricants, and, combined with the middle oils, make good Diesel fuel—in fact, it is scarcely necessary

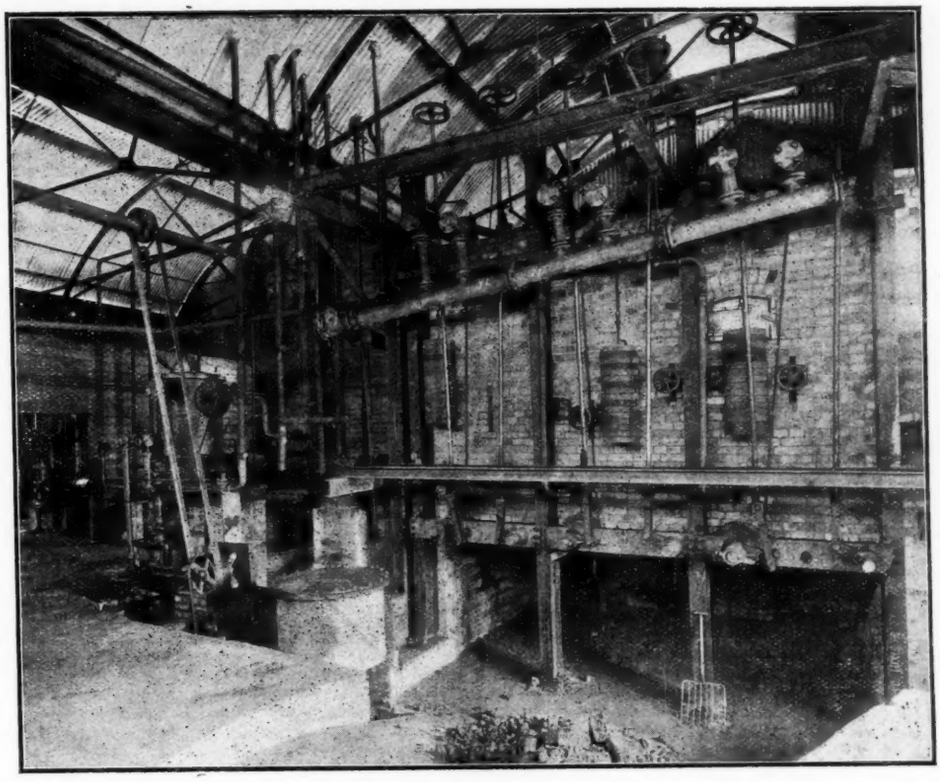
EXTRACT OF RESULTS OBTAINED BY LOW-TEMPERATURE CARBONIZING AT A TEMPERATURE UNDER 1200° FAHR.

Name of Coal.	ANALYSES. Coal.					ANALYSES. Tarless Fuel.					YIELDS PER TON OF COAL CARBONIZED.							
	H_2O.	V.M.	F.C.	Ash.	N.	H_2O.	V.M.	F.C.	Ash.	N.	A Spirit.	Light Oils.	Heavy Oils.	Total Oils.	Tar Acids, Cresylic.	Pit Pitch.	Sulphate.	Tarless Fuel.
											Galls.	Galls.	Galls.	Galls.	Galls.	Cwt.	Lbs.	Cwt.
Ballengleich (Natal)	3·34	25·10	53·65	19·0	..	3·7	9·85	63·11	23·34	..	3·25	3·9	4·0	15·2	1·8	0·34	36·5	16
Forest of Dean	3·1	31·2	58·57	7·0	..	dry	12·9	78·4	8·7	..	2·0	5·7	5·4	15·2	..	..	13	15·9
Hulton	dry	34·73	50·06	7·21	..	dry	8·26	82·85	8·89	..	0·83	4·9	7·9	18·4	..	..	20·7	14·7
Maltby Main	13·0	29·2	..	8·9	..	..	..	.	11	..	4·50	5·7	4·7	16·3	..	..	9·5	14·5
Silkstone, Beanshaw	..	30·9	..	..	..	..	8·0	81·6	10·4	..	5·06	6·0	6·1	17·2	..	..	..	..
Silkstone, Winter Slack	dry	32 85	58·31	8·84	..	dry	7·71	82·3	9·99	..	0·4	4·4	10·5	19·8	..	..	12·1	15·5
Silkstone, Two Foot Slack	dry	32 96	57·39	9·65	..	dry	8·08	75·52	16·4	..	0·5	5·0	11·0	22·0	..	..	10 91	15·75
Niddrie Cannel	dry	50·87	44·4	4·73	..	..	..	..	..	..	5·0	12	19	..	..	2·37	17·4	10·0
Newbattle Cannel	1·14	50·23	44·06	4·33	..	..	..	..	..	..	5·0	13·5	28·5	..	..	2·06	21·8	10·0
Hucknall Belt Pickings	3·8	21·2	43·7	31·0	..	..	..	..	34	..	2·2	7·52	2·27	14·2	..	0·39	11·0	14·4
Sulphide Corporation (Australia)	2·08	31·8	55·9	8·43	1·75	..	10·3	75·4	18 26	1·95	5·37	..	8	16·4	..	0·67	19·8	15·5
Bignall Hill Washed Pearls	..	..	..	5·4	..	..	..	..	7·4	..	2·5	5·7	4·0	22·0	..	0·8	23·8	14·0
Tilmanstone (Slack) Kent Coal	..	..	..	..	..	..	..	..	12·5	..	2·5	6·0	4·5	20·3	..	63·5 p.ct.	22	16
Snowdon (Kent Coal)	..	..	..	..	..	..	..	..	13·8	..	3·0	8·0	3·9	17·3	..	62·0 p.ct.	19·2	16
Stanton Iron and Coal Company (Cannel)	..	..	..	..	..	..	..	..	..	..	7·6	7·92	11·88	44·0	3·08	..	25·33	10
Wigan (Cannel)	1·64	57·82	36·61	3·93	..	2·25	7·96	82·77	7·02	1·30	6·8	14·7	44·7	85·1	8·0	1·15	22·0	10
Lignite (Spanish)	5·24	35·74	..	9·99	1·30	..	12·50	15·60	..	1·24	2·2	4·4	6·95	22·71	..	..	18·5	11
Shale (Spanish)	..	..	..	..	..	..	..	..	..	..	1·1	1·2	17·00	30·1	..	..	19·1	worthless
Glapwell (Slack)	..	..	..	..	..	..	..	..	..	..	3·54	5·03	5·40	17·96	13·0	..	18·6	16
Glapwell (Nuts)	..	..	..	..	..	..	..	..	..	..	4·39	10·17	8·39	28·09	..	..	10·2	15·5
Tyne Boghead Cannel (Mickley)	..	..	..	..	..	..	..	..	..	..	3·12	14·9	19·94	53·5	..	..	23·0	14·0

NOTE.—In addition to the production of spirits (petrols) obtained from the fractionation of the tar oils, an additional 2 to 4 gallons per ton of coal carbonized will be obtained by "stripping" the rich gas which must be added to that tabulated in this statement under Column A.

***Cokes.*—The cokes contain from 7 p.ct. to 12 p.ct. of volatile matter.**

***Tar Oils.*—These fractionate into tar acids (cresols), and represent (approximately) 7 p.ct. to 14 p.ct. of the crude oils. The oils contain 5 p.ct. to 8 p.ct. of paraffin wax.**



FRONT VIEW OF RETORT-SETTING—COMPRISING A COMPLETE UNIT OF SIX RETORTS, WITH LOCKING GEAR, AND MAIN LEADING TO CONDENSERS.

to separate the two for this purpose. Quoting Dr. Mollwo Perkin, he states that "the spirit obtained has a specific gravity of about ·800, and resembles very closely motor spirit obtained from petroleum. The middle oils have a specific gravity of about ·900, and a flash point of 138° Fahr., and the heavy oils a specific gravity of about ·960, and flash points varying from 118° to 178°, which meets the Admiralty specification for fuel oils for war vessels.

Paraffin Wax.

The tar acid cresols contained in the oils range from 10 to 22 p.ct., and are excellent disinfectants. There is no trace either of naphthalene or anthracene.

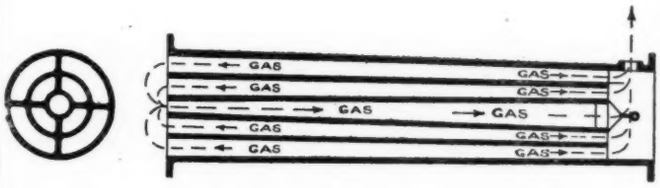
DESCRIPTION OF THE PROCESS.

The Low-Temperature Retort.

Low-temperature carbonizing cannot be successful without perfect mechanical appliances; and this applies principally to the retort. Although we are far from arrogating to ourselves that what is now to be described is the last word in the design of low-temperature retorts, yet we are justified in feeling that the "Tozer" retort has gone further than any other appliance in solving the main problem of low-temperature carbonization. It is unnecessary to dwell on the time, labour, and considerable capital expenditure which have been spent evolving the retort, because nothing was taken for granted, and the rather expensive process of scrapping bench after bench of retorts was indulged in until the desired solution was arrived at. During this process we covered, for our own satisfaction, most of the ground previously covered by others.

A beginning was made with a battery of 10-in. tubular retorts; but the time required for complete carbonization was too prolonged. These were scrapped, and 8-in. and 5-in. tubes were tried respectively. The 8-in. tube was a failure—the time period being again too long; but the 5-in. one brought us nearer to the the mark—viz., a short period of carbonization (some 4½ hours) with a temperature of 1000° Fahr. By this time, the principle was established that to carbonize rapidly at a low temperature, the coal must be arranged in comparatively thin layers. Batteries of 4½-in. or 5-in. tubes are out of the question, on account of the space occupied and excessive labour in manipulation. Retorts of the slot type would have to be of inordinate length to width to accommodate a workable charge. Besides, in such an elongated cross-section, they would, unless of great thickness, be incapable of resisting the pressure due to the expansion of the charge.

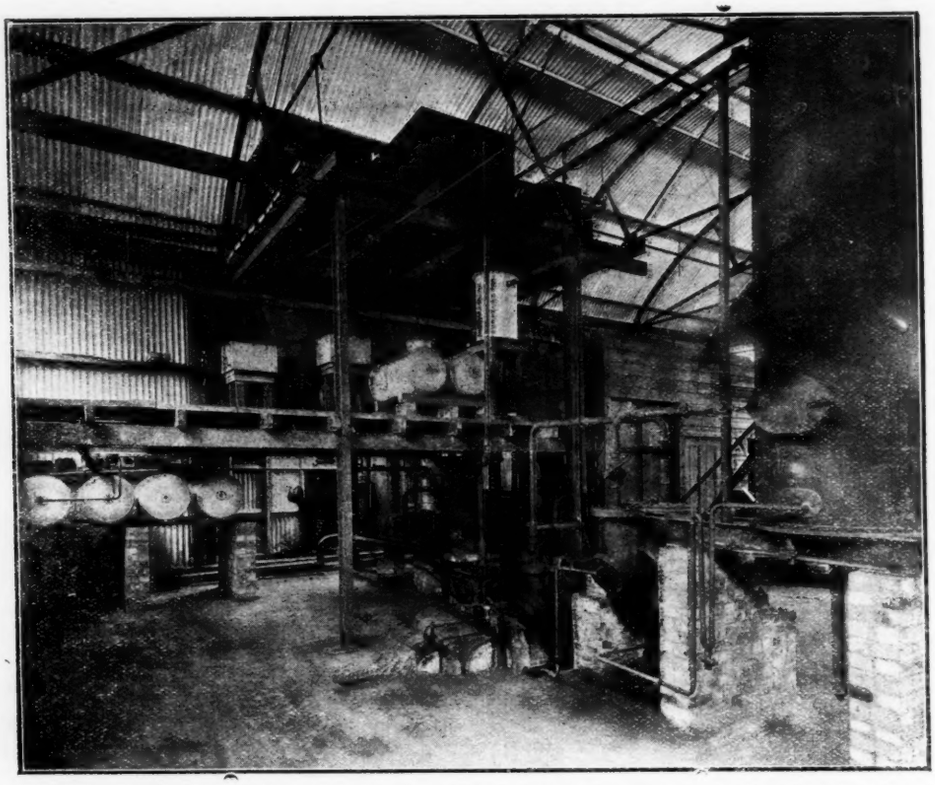
The method hit upon to deal with the thin layers of coal was to distribute it in the form of a circle or annulus; and a battery of retorts was erected on this plan. The success was immediately evident; but the charge was too limited in quantity. Then a second series of retorts was constructed with two annuli—one disposed concentrically within the other—and to convey the exterior heat of carbonizing through the first annulus of coal to the second or inner annulus, the annuli were divided by ribs into vertical sections or cells; advantage being taken of the conductivity of cast-iron to induce these ribs (which extend the entire length of the vertical retorts) to conduct the exterior heat to the inner annulus. By dividing the coal in this way, we find we can carbonize in 4½ hours. But—and this is most noteworthy—were we to distribute the coal contained in these two divided annuli into a single annulus of double the thickness, the time required for carbonizing would be so prolonged as to render the use of a retort of this description commercially impossible. This is the whole theory of the retort in a nutshell. It has been previously stated that low-temperature hydrocarbon gases are extremely sensible to temperature, as they are so very unstable; and it is for this reason that the period of carbonization must be performed in the shortest space of time, and the gases removed from the retort with all possible speed.



Tozer's Patent Retort.

Referring to the appended diagram of the retort, it will be seen that the inner tube formed by the surrounding annuli is not filled with coal, but acts as a gas passage, connecting the upper and lower ends of the retort. The gases evolved can thus pass partly upwards through the body of the coal and partly downwards. Such gases as pass downwards find their exit upwards through the central tube, meeting in the upper part of the retort the gases which pass directly upwards from the upper half of the charge. Undoubtedly, there is a neutral point, which naturally varies, where the gases are divided into an upward and a downward stream, thereby accelerating their exit velocity.

The charging and discharging doors are made tight by a special arrangement, and the lower door is balanced by counterweights and easily locked by a well thought-out arrangement. When carbonizing a caking bituminous coal, the coke comes out in slabs practically the length of the full height of the retort, and configuring exactly to the shape of the cells of the retort. If the coal is a non-caking one, the coke comes out almost in the same physical condition as the entering charge. The retort will deal with practically every description of carbonaceous material, caking and non-caking coals, shales, lignites, and peat, in every physical condition, from 3 in. down to dust, and will carbonize and produce coke from colliery sludge or washings. The retorts



LIGHT-OIL RECOVERY PLANT, WITH TOWER AND ROTARY SCRUBBERS, AND STORAGE TANKS.

are heated by a specially-designed recuperative setting, in many ways a departure from the recuperative settings that were employed on a gas-works.

The accompanying photographs show a setting of six of these retorts which have been in constant use for over six years, and indicate no sign of deterioration. The retorts will hold about a quarter of a ton per charge. They are considerably smaller than the original design, as they had to be erected in an existing building, which restricted the size of the unit. But the retorts which are about to be erected on the Continent, and likewise for a large installation in the Midlands, will carbonize about 25 cwt. per charge. The Continental plant to be erected will be capable of carbonizing 200 tons per diem, and the Midland plant 350 tons per diem. In each installation the resultant coke will be used to produce power gas and ammonia. The power gas, in its turn, is to be used for steel furnace firing, boilers, and the production of electricity.

Conclusion.

It is necessary to distinguish such a process as described from the ordinary gas-works operations, which operations have first and foremost the production of a maximum yield of gas—that being the primary object, the tars and ammonia being of secondary consideration. On the other hand, the low-temperature process may have for its primary objects the recovery of tar oils or the manufacture of a domestic fuel, or power gas and ammonia; the relative importance of one to the other being determined by final production. This system is the fundamental distinction between the two systems.

Beyond, perhaps, the sale of coke for domestic purposes, there is no question of competition. Each process has its distinct sphere of operations and usefulness. Anyway, high-temperature carbonization is necessary for benzol production, as without this commodity the British dye industry could not exist. It must be admitted, however, that a plentiful supply of motor spirit, fuel oils, &c., besides a free burning smokeless fuel, are likewise urgent necessities; and it is in this direction that low-temperature carbonization is working.

With practically everything in the melting pot, industrially speaking, especially as regards the price of coal, wages, materials, &c., the casting of a balance-sheet at the present moment showing the net profit to be derived from the conversion of the coal would be an extremely hazardous proceeding; but from our past six years' experience of working costs of carbonization, fractionation of the oils, &c., the writer is convinced that, with any conditions approaching the normal, low-temperature carbonization would return a high yield on the capital invested. We have carried our researches, not laboratory researches, but on quite a practical scale, by carbonizing up to 50 tons a week hundreds of samples of every type of British coals, cannels and shales, good coals, bad coals, and rubbish, and other coals, cannels, shales, and lignite from many parts of the globe—Australia, Malay, France, Spain, and South Africa—and we have been able to tabulate results as to the yield of oils, &c., which we venture to think have never hitherto been tabulated.

In this article I have tried to place the results of our experience, with all the labour, capital, and infinite patience thereby involved, in plain language before your readers. In drawing attention to the large figures of losses, and the enormous quantity of coal involved, the writer does not imagine for one instant that such a colossal enterprise of conversion could be dealt with by any single enterprise; but by dealing with only a moiety of the 100,000,000 tons, it could be accomplished by groups of undertakings. The view held is that the carbonizing plant should be erected in the vicinity of the pits, and that the bye-products be treated at common centres on the co-operative principle. When one considers that the gas-works of the United Kingdom carbonize annually some 16,000,000 tons of coal, and that the capital involved must be somewhere near £150,000,000, it would not be, after all, such a stupendous undertaking to treat (say) another 16,000,000 tons by low-temperature carbonizing; and the capital required would only represent a fraction of that sunk in the various gas undertakings.

In conclusion, I wish to acknowledge with gratitude the collaboration and help that Mr. Tozer (my colleague) and myself have received from Dr. George Young, from Dr. Mollwo F. Perkin, and from Dr. Dunstan, and especially the support we have received, and are still receiving, from Mr. Hugo Hirst, the Chairman and Managing-Director of the General Electric Company.

Metropolis Gas Supply.

The accounts of the Metropolitan Gas Companies are dealt with in a report of the Public Control Committee to be submitted to the London County Council to-day. The Orders made under the Temporary Increase of Charges Act are explained; and the Committee remark that, though it is difficult for the Companies to estimate accurately the charge necessary to preserve equilibrium, from an examination of the revenue figures they are led to think the present maximum prices are somewhat in excess of those necessary to give the relief contemplated by the Act, and will need to be revised by the Board of Trade as and when opportunity occurs. "At the same time," they add, "we have no evidence that the Companies are not prepared to adjust and reduce the charge as occasion demands. . . . The main point to be guarded against is that the Companies should not be permitted to take advantage of the suspension of the sliding-scale to increase their revenue balances to an unusual extent." They also deal with the quality of the gas supplied, and recommend that, as the extraction of benzol from manufactured gas is no longer necessary for munition purposes, and as the retention of the benzol and a reduction in the quantity of incombustibles would not involve an increase in the consumption of coal, the Council is of opinion that the Order dated June 28, 1918, should be withdrawn or amended.

A NEW DESIGN OF VERTICAL RETORTS—THE "CENTRAL" SYSTEM.

Gas engineers who appreciate concentration of control inside the retort-house will no doubt welcome the introduction of the "Central System of Vertical Retorts," which Messrs. Firth Blakeley & Co., Ltd., of Leeds, are placing on the market, and of which we are enabled to give a brief description.

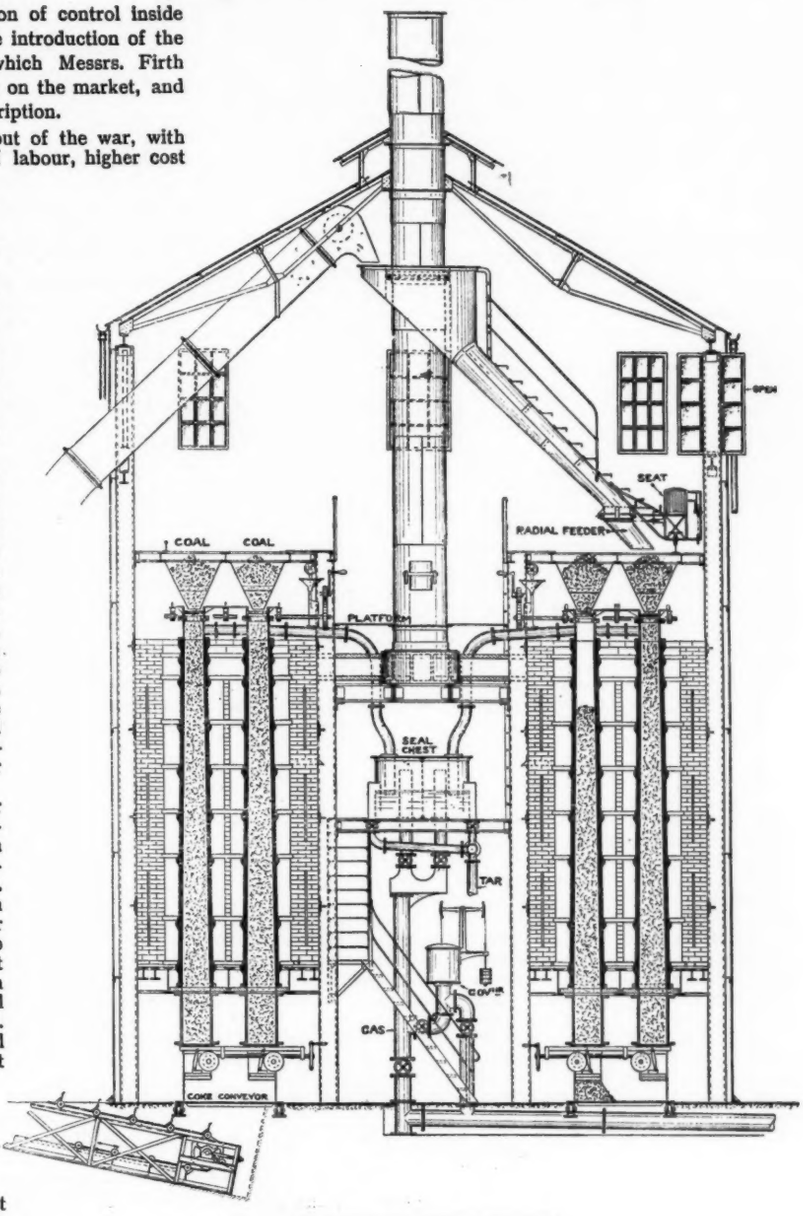
In view of the new conditions arising out of the war, with greatly increased wages, reduced hours of labour, higher cost of materials, and the need for quick replenishment of partly exhausted resources, it is of the greatest necessity that the production per unit of labour should be enlarged by the introduction of more modern and improved methods for the carbonization of coal at gas-works, and obtaining therefrom products of the most economical value. To this end vertical retorts have already proved a most important factor; and it is, we understand, with this view of their usefulness that the plant now to be described has been designed, which embraces many novel and labour-saving features.

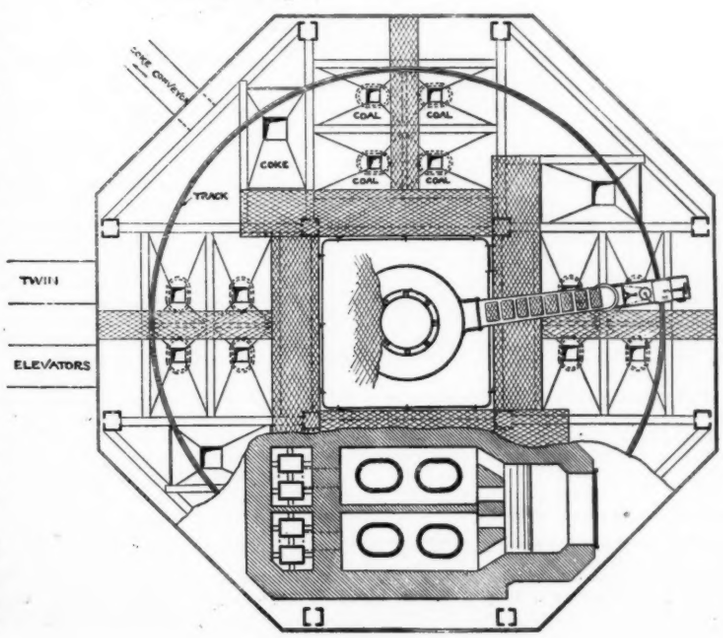
The design illustrated shows a sectional elevation and plan of four beds, each of four retorts; the sixteen retorts being capable of an output of over half-a-million cubic feet of gas per twenty-four hours. The system shown is of the semi-continuous type; but it is intended to make use of the same design for intermittent working also. The heating system is of the usual type, with ample regenerative flues for both primary and secondary air—each capable of easy regulation, and each bed having a separate flue to the central chimney. The latter is lined with fire-brick, and each bed can be separately regulated by dampers—thus giving more efficient control over their working.

The coal for the retorts and the coke for the producers is deposited into the measuring hoppers by means of an elevator which may be in duplicate, through the intermediary means of a radial shoot or feeder. The feeder is of taper shape, carried on ball bearings or runners around the upper part of chimney, with a shoot leading to the hoppers. At the lower end of the shoot is provided a swivel extension, which can be worked radially to enable the material to be guided into the hoppers as required. The main inclined shoot is also provided at its lower extremity with a driver's seat on a runner carriage. This runs on a circular track over the top of the hoppers; and all the movements for travelling over the track and working the radial shoot extension are controlled from the driver's seat. The shoot is provided with a cut-off door, and is operated from the same seat, as required, while the shoot is travelling. Steps and a handrail are provided for giving access to the receiving end of the feeder and elevator head.

The radial feeder is a valuable labour-saving feature, and is most useful in its function of filling the measuring hoppers while the man in charge remains seated, and retains full control over the whole operation from this position—thus releasing him from the necessity of pushing charging machines or tip wagons over uncomfortably hot beds. This method also asserts its utility when the retorts are being charged with coke after scurfing, &c., or for the initial charge, as coke may be deposited into the coal measuring hoppers with the same facility as into the coke-hoppers, without additional plant or labour. The twin elevators supply coal or coke to the feeder as required; and the chargeman signals his requirements to the elevator man, who is outside the house. By arrangement, one elevator may be used for coal or coke; the other acting as a standby.

It will be observed that the measuring hoppers above the retorts are capable of holding sufficient coal for a single charge on the continuous system, which can be reduced or increased at will. A similar





quantity represented by coke is taken out at the bottom. They are preferably of the open type as shown, as sight-feeding has certain advantages over a sealed measuring hopper, when there is a liability of gas, air, and coal dust forming an explosive mixture. Explosion doors are usually provided in sealed hoppers to guard against this risk. The act of opening the coal door or valve to admit coal into the retort automatically closes a valve in the take-off pipe, or seals the dip-pipe, and thus prevents indrawing of air, back-firing, as well as the danger of explosion. The addition of this extra piece of apparatus justifies itself by the feeling of safety it gives to the operator, as most continuous systems are not entirely immune from the risk of explosions.

At the bottom of the retorts, a special arrangement is provided, enabling a measured quantity of coke to be discharged upon a slowly revolving table conveyor, which, by means of a deflecting plate, deposits the coke into a drag link or other conveyor, which carries it to the outside hoppers and screening plant. When the furnaces are clinkered, the clinker and ashes may be removed in a similar manner by the revolving conveyor, and deflected in another direction. No coke quenching is required—the coke being cooled sufficiently in the extension piece below the bottom retorts. This extension piece can be air-jacketed if found advisable; the hot air being utilized for the primary or secondary air supply.

The four retorts of the bed may be charged simultaneously, to ensure equal contraction of the beds, and one or more retorts may be discharged at a time. The doors in both cases are of the single-acting type—the action of both loosening and opening, or closing and locking, being performed by one movement. The top doors are arranged so that the gear is independent of the vertical expansion or contraction of the bench. The top door gear handles are arranged in four sets of two or four each; each set being on one side of a square platform. There are also platforms over the coal and coke hoppers, as shown on plan; and all points over the bunkers are easily accessible. There is a thoroughfare underneath all the beds, both from the inner chamber and from the outside of the beds. The coke-hopper levers are side by side with those of the top retort doors.

Comparing the relative time taken to charge retorts, the present system effects a great saving in time and labour, especially so where tip-wagons for producer coke and charging machines for retorts are used. No overhead conveyor or storage hoppers being necessary over the charging hoppers, there is also economy in this respect.

The pipe arrangements for gas and tar take-off are quite simple—the gas passing quickly from the retorts into a four-chambered seal-chest, one chamber for each bed—and can be made either on the anti-dip principle, or else with seal-regulating valves in the usual manner. If on the anti-dip principle, the automatic arrangement already mentioned for sealing the dip-pipe during charging, safeguards a non-seal condition in the seal-chest. The tar is taken away from this seal-chest in the usual manner after passing over weir-valves—arranged to always leave a liquor seal—and is led to the usual tar-tank. A sight-feed drip-flushing arrangement, fed by an overhead tank or pump, is constantly flushing the descending gas-mains from the retorts, and thus helps to keep the pipes clear, in addition to providing the seal-chest with a liquor seal. When it is required to give the pipes a full flush, a sleeve on the drip-pipe can be unscrewed until it meets the cup-pipe; thus forming one continuous pipe. The water or liquor valve is then turned full on as required.

The gas-main leaves the retort-house at ground level, and is led to suitable condensers. A retort-house governor is provided, generally beyond the condensers, but shown, for purposes of illustration, inside the house. All parts between the settings are easily accessible for inspection. The seal-chest, being in four sections, any of the four beds can be cut-off for repairs or cleaning.

The retorts, of course, can be steamed in the usual manner, in accordance with modern practice for increasing the make by the addition of water gas. It is expected that two men, one above and one below, will be able to carry on all the operations in connection with the plant.

The whole system is covered in by roofwork carried on stanchions, and the centre chimney is guyed by the roof trussing; the design generally lending itself to an attractive and handsome addition to a gas-works.

The complete system and arrangement of retorts is fully protected by patent, and is claimed to be a decided improvement on existing procedure; convenience and celerity of operations having been carefully considered. It has also many structural advantages, for the elevators and conveyor may be placed at any one or more of the octagonal sides of which the house is composed, irrespective of the internal lay-out of plant. Less floor space is used, and the building is below the average height for such structures—a factor adding to strength and symmetry. The building walls may be either on the by-rib principle or of the steel-framed brick-panel type.

The design illustrated is for four beds of retorts. It will, however, readily be understood that a larger number of beds can be adopted—these being placed to form a regular polygon in plan. The triangular spaces between the beds are utilized for the producers and regenerators—a separate one being provided for each.

The meeting of the Coke-Oven Managers' Association held at Sheffield on Saturday was not open to the Press for reporting purposes.

NATIONAL GAS-ENGINE COMPANY'S WORKS AT ASHTON-UNDER-LYNE.

[A Description Prepared for the Manchester and District Junior Gas Association Visit on Feb. 22—See last week's "Journal."]

The Company was founded in 1889, by Mr. Henry N. Bickerton, one of the leading authorities on internal-combustion engines, and has, from very small beginnings, developed into one of the largest concerns in the world devoted exclusively to the manufacture of internal combustion engines and suction-gas plants. The Wellington Works are at the west-end of Ashton-under-Lyne, near Manchester. They are effectively served by five of the leading railways, which give easy access to all industrial parts of the country and to the principal shipping ports. The Company employ 2000 men, and have an output of about 270 engines a month, with a proportionately large number of suction-gas plants.

All the shops are equipped with the most modern machinery; and in order to ensure absolute reliability in materials and workmanship, all parts of the engine are manufactured from beginning to end by the Company. Not only are the practical and commercial sides of the business carefully watched, but the scientific side of the work receives special attention—the latter particularly under the supervision of Sir Dugald Clerk, K.B.E., the eminent engineer and gas-engine expert.

Description of the Works.

The shops consist of nineteen large bays, all electrically lighted, heated by steam, and fully equipped with electric travelling cranes. The scheme of driving in the works illustrates the advantages of the gas-engine in sectionalizing power in industrial establishments. Gas-engines are installed at various convenient centres; about a dozen of them being in use. Gas for these and for engines on test is generated in a 2000-H.P. Mond gas plant.

The vertical engines are of the tandem enclosed type, and are manufactured in sizes of 120 to 2000 H.P. They are constructed to work on town, producer, blast-furnace, or coke-oven gas. Like all "National" engines, they are of the Otto type, and work on the four-cycle principle. The chief advantages of the National vertical engine are that it occupies less floor space than any other type; it is more quickly and easily started, on account of the number of cylinders available and smaller fly-wheel necessary; it gives a more even turning movement, because it has a greater number of impulses per minute—in the case of a 1000 H.P. engine it has at least twice the number of impulses per minute as those of a twin double-acting gas-engine of the same power; it has not any water-cooled pistons, piston rods, or valves; and all moving parts are enclosed, and are supplied with oil under pressure, which guarantees reliability and freedom from wear. It is also more economical in oil, and gives better governing.

All the working parts are kept to reasonable size; and as cylinders, pistons, valves, &c., are all made to standards, these parts are interchangeable, so that a comparatively small stock of spare parts is required, and any part can be immediately renewed from stock.

With the large experience the Company have had in manufacturing these engines, they have been able to make considerable improvements in the design. For instance, by making cylinders of a soft metal and using a hard metal as a working liner, they have been able to add considerably to the life of the cylinders, and at the same time they have got away from the troubles caused by cracked cylinders, due to unequal expansion on a comparatively hard cylinder.

As regards coke-oven gas, the Company are now fitting a patent gear, which, by controlling a mixture of cooled exhaust to live gas, brings the gas value down to 135 B.Th.U. per c.ft.—thus making the engine easier to govern, and at the same time rectifying many of the troubles caused by an excess of hydrogen in the gas. With this gear fitted, it is possible to change-over the engine without stopping from producer to coke-oven gas, or *vice versa*. It allows them to increase the cylinder compression, and adds to the economy, while lessening the chances of pre-ignition, owing to too rich a mixture.

For blast-furnace work the Company's engines are exceptionally well suited, as they can use the gas from the furnaces after being suitably cleaned. No boilers are therefore required. There are at the present time over 100 in work.

At the works there is one 450 H.P. engine working on town gas, as well as a 300 H.P. and a 120 H.P. engine working on Mond gas. There is also a National vertical blower, with four double-acting cylinders, each fitted with piston valves to control the inlet and outlet of air to each cylinder. The reciprocating parts are totally enclosed, and lubrication is effected under pressure; the oil being supplied from a separate oil service. The blower is driven through a flexible coupling by a short shaft, which is direct-coupled to the gas-engine fly-wheel, and which is supported in a substantial bearing. The blower is designed to deliver 24,000 c.ft. of free air per minute, and deliver it against a pressure of 12 lbs. per square inch, when running at a speed of 200 R.P.M.

By means of cutting-out one or more cylinders, the maximum pressure against which the blower will deliver a reduced volume of air can be raised to 15 lbs. per square inch.

The "FLETCHER"

EXTERNALLY-HEATED

GAS KITCHENER.

(*PATENT.*)

GAS COMPANIES

ARE SPECIALLY . INVITED TO WRITE FOR PARTICULARS AND PRICES OF THIS COOKER . . BEFORE ADDING . TO THEIR LIST FOR HIRE.

MAY ALSO BE FITTED WITH OPEN HOTPLATE IF PREFERRED.

THIS COOKER IS OF A NOVEL TYPE and—as its name implies—is a Gas Kitchener, showing that it can be used on the same lines as a Coal Kitchener, but without the disadvantages of the latter. The Oven is specially designed for those people who prefer to have their cooking done with the Gas consumed outside the Oven; also to suit the requirements of every housewife, who will find that she can readily heat the Oven either externally or internally at will.

This Gas Kitchener also meets the arguments advanced by the Salesmen of Electrical cookers against the use of Gas for cooking, who are eager to persuade consumers that internally-heated gas ovens are not desirable. This, of course, is a fallacy, as millions are in daily use—still the suggestion rankles in some people's minds; so here is a cooker which can be externally heated, in which the cost of the Gas consumed is far less than that of the electric current required to cook exactly the same dishes, which is a very important consideration in these days when it is necessary to practise the most rigid economy in every possible way.

Anyone who is used to cooking with an ordinary Coal Kitchener will at once be able to use this Gas Kitchener successfully and with far less trouble and discomfort than is possible with the coal range, and, needless to add, at very much less expense.

The Hotplate is entirely enclosed, with panelled plates and removable rings, presenting a similar appearance to the top of a Coal Kitchener.

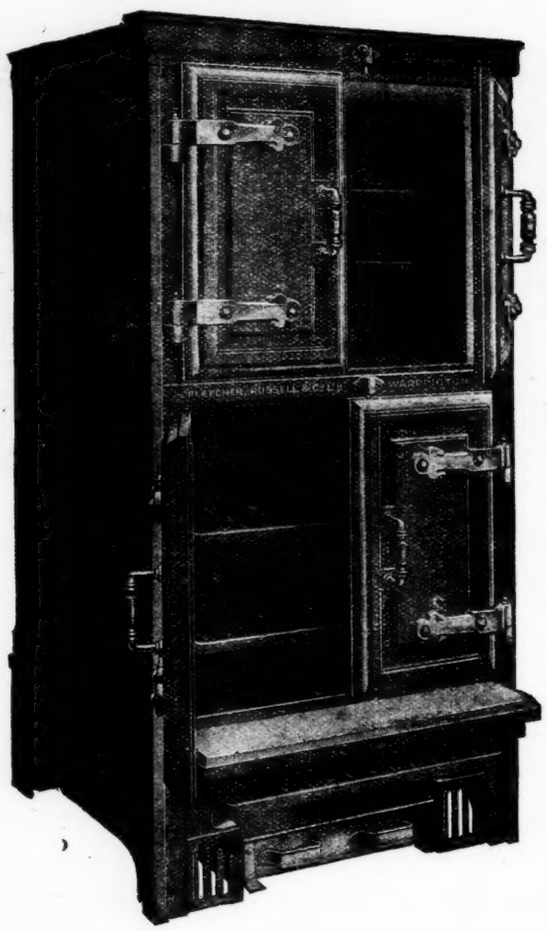
The Oven is so constructed that it can be used for either internal or external heating, the action being reversed by a small lever, and the temperature is always under perfect control.

FLETCHER, RUSSELL, & CO., Ltd., Warrington, Manchester, and London.

The "FLETCHER"

SPECIAL ROASTING and BAKING OVEN

Externally Heated Top Oven.



This is an adaptation of our well-known No. 30 "St. James'" Oven, the outside sizes being 37½ in. wide, 72 in. high, 36 in. back to front. The body is strongly made in cast iron, divided specially into two compartments, each of which is fitted with sheet enamelled linings.

The lower compartment is internally heated and is used for the purpose of roasting; the upper one is *heated externally* by means of the same burners which heat the lower one. Thus this compartment is specially suitable for baking rice puddings, pastry, &c., which may be done simultaneously with the roasting.

When the door is closed the top Oven is perfectly sealed, so that the waste products from the bottom Oven cannot penetrate into it. The temperature is under perfect control at all times.

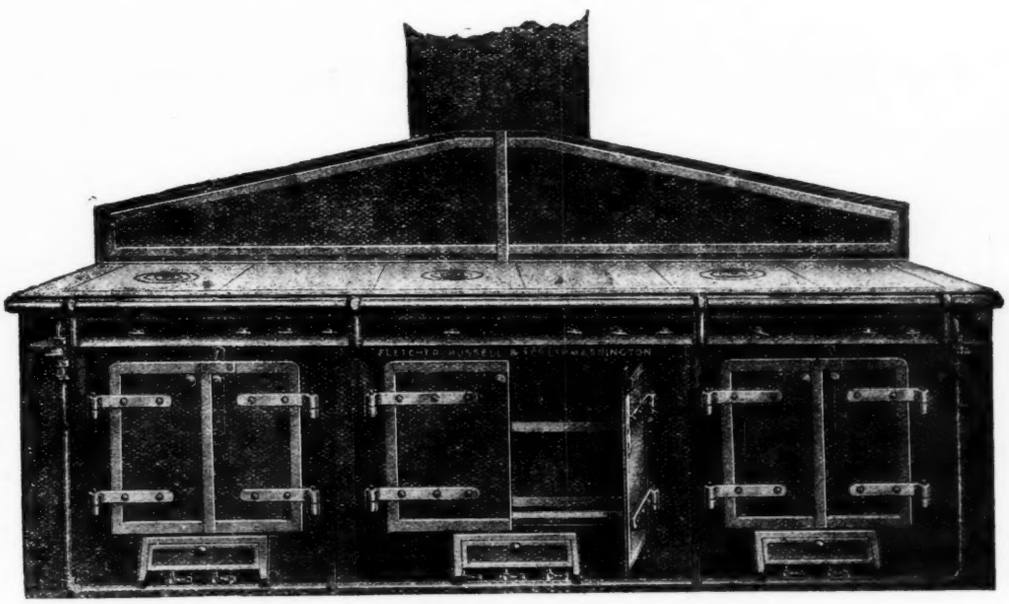
For full particulars please apply for our Illustrated Pamphlets.

FLETCHER, RUSSELL, & CO., LTD. WORKS: WARRINGTON

London Office & Showrooms: 15, Fisher Street, Southampton Row, W.C.1.

The "Langham" Range.

EXTERNALLY-HEATED OVENS.



This range is of the same type as the Langham Central range, but all the ovens are on one side, not back to back as in the Central range, and the flues are constructed for upward draught only.

The "London" Confectioners' Ovens.

These Ovens are strongly constructed throughout of cast iron, with panelled sides and doors. They are most evenly heated by means of 3 burners in sizes Nos. 1 and 2, and 4 burners in sizes Nos. 3 and 4, each burner being provided with a separate tap. They are made up with double-cased and packed sides; are **externally heated,** and are supplied with brick soles. They are easily taken apart for packing purposes or removal.

The most perfect pastry oven made.

Temperature may be regulated with ease.

MADE IN FOUR SIZES.

For full particulars please apply for our Illustrated Pamphlets.

FLETCHER, RUSSELL, & CO., LTD. WORKS: **WARRINGTON**

London Office & Showrooms: 15, Fisher St., Southampton Row, W.C. 1.

NEW DEVELOPMENTS IN SPECIAL GAS COOKING APPARATUS

For Hotels, Clubs, and Large Institutions.

The "Langham-Central" Range.

The Range illustrated in the photograph has been recently installed in the kitchen of an important London Club, where the principal part of the cooking was previously done on a Central Coal Range, which has now been superseded. The existing downward flues have been utilized without reconstruction, and the Central Gas Range is working perfectly.

The Langham-Central Range is constructed in heavy cast iron, with a hotplate which is entirely enclosed, and is fitted with a stout frame with several plain panels which are ground and glazed all over, thus presenting a level, smooth surface on which utensils may be moved about with ease. The burners under the plates are so arranged that any desired temperature may be obtained in any part of the hotplate, and the whole of the surface may be utilized for either boiling or simmering, the heat in all parts being easily regulated. When the plates have been thoroughly heated alternate burners may be turned out, and it is often found possible to turn out all the burners under alternate plates and still retain a sufficiently high temperature.

For full particulars please apply for our Illustrated Pamphlets.

FLETCHER, RUSSELL, & CO., LTD. WORKS: **WARRINGTON**

London Office & Showrooms: 15, Fisher Street, Southampton Row, W.C. 1.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

FORTY-NINTH ANNUAL MEETING.

THERE was a good attendance of members at the forty-ninth annual meeting of the Manchester District Institution of Gas Engineers, which was held in the Midland Hotel, Manchester, on Saturday afternoon. During the early part of the proceedings, the chair was occupied by Mr. JOHN P. LEATHER, of Burnley, the outgoing President; but after the transaction of the formal business, he introduced his successor, Mr. ARNOLD E. MOTTRAM, of Ossett, who delivered his Inaugural Address.

The minutes of the last meeting having been taken as read, and confirmed,

The HON. SECRETARY (Mr. G. S. Frith, of Runcorn) announced the receipt of a number of apologies for absence, these including letters from Mr. Samuel Glover, and the Presidents and Secretaries of various District Associations. Mr. Frith, however, pointed out that they were fortunate enough to have with them Mr. W. G. S. Cranmer, the Secretary of the Midland Association; and they were very pleased indeed to have him with them.

NEW MEMBERS.

A welcome was then extended to the following new members: Mr. A. F. Ames, Gas Engineer, Padiham; Mr. W. W. Atley, Whitwood Chemical Company, Ltd., Normanton; Mr. F. W. J. Belton, Gas Engineer, Macclesfield; Mr. J. H. Clegg, Assistant Engineer, Burnley; and Mr. J. A. Gray, Gas Engineer, Ashton-in-Makerfield.

NATIONAL GAS COUNCIL AND DISTRICTING.

The PRESIDENT (Mr. J. P. Leather, of Burnley) then asked the Hon. Secretary to read a letter, dated Feb. 20, which had been received from Mr. W. J. Smith, the Acting Secretary of the National Gas Council, in response to a resolution passed at the last meeting of the Institution in Manchester. The letter was in the following terms:

> Referring to the resolution of the Manchester District Executive Board, forwarded through Mr. Tagg, of Preston, I am instructed to inform you that the Central Executive Board, at their meeting on the 18th inst., unanimously resolved to agree to the application for the division of the present "Manchester District" into two parts—one to consist of Lancashire, and the other to comprise that portion of Yorkshire usually included in the term "Manchester District." Each of the two subdivisions will be entitled to elect four members to the Central Executive Board; and I am to ask that you will be good enough to convene meetings for this purpose.
>
> If you could possibly let me have a list of the undertakings which will be included in each area, it would be extremely useful.
>
> It has been suggested that a portion of North Wales might be included in the Lancashire area; and perhaps you would be good enough to communicate with Mr. R. S. P. Prince, at the Gas Offices, Holywell Street, Flint, in this connection.
>
> I am communicating with York, Harrogate, and Selby, to find out whether they wish to be included in the new area, or in the Northern District.

THE HON. SECRETARY remarked that, in addition to the four members of the Central Executive Board referred to in the letter, it was quite understood that they would be entitled to elect twelve members on the General Committee. The meetings for the election of the members had been arranged for. That for the Lancashire Section would take place next Friday, in the Town Hall, Manchester, at 3.15. The Yorkshire Section meeting would be held in the Lord Mayor's Parlour, Bradford, on the following Monday, at 3 o'clock. He thought it was quite clear what was intended. There were certain towns which would have a choice, and might prefer to come into one district or the other; and in these cases it was left to each undertaking to decide. He would like to take the opportunity of explaining that, at the previous meeting in Manchester, when appointments were made, it was understood that they should make them from the point of view of undertakings. They appointed the undertakings, and not individuals. The list had to be got out without delay; and in inserting the names, he was in some uncertainty. Any error could, however, be corrected. All undertakings would be notified; and they could put down what name they liked. They were practically working on the Commercial Section divisions.

THE REPORT AND ACCOUNTS.

The next business was the consideration of the report and accounts. The Committee reported that the membership now stands at 206, which is an increase of three over the previous year. They recorded with sincere regret the death of Mr. James Braddock, of Radcliffe—one of the founders of the Institution, a Past President, and the Hon. Treasurer at the time of his death. They also regretted to record the deaths of Mr. John Furniss, of Slaithwaite, Mr. Charles Harrison, of Accrington, and Mr. Fred Kent, of Worksop. Difficulties of travel made it impossible to arrange any visits to works during the year; but in addition to the usual business meetings, there were three special ones for the consideration of matters of moment. The Committee added that the annual reports of the Lancashire and the Yorkshire Commercial Sections contained records of much useful information. Mr. G. S. Frith, of Runcorn, was elected the representative of the Institution on the Council of the Institution of Gas Engineers, and Mr. J. P. Leather, of Burnley, as the representative on the Executive Committee of the National Gas Council. Mr. S. Tagg, of Preston, and Mr. A. E. Mottram, of Ossett, were appointed the representatives on the Councils of the Lancashire and Yorkshire Junior Associations respectively. The statement of accounts accompanying the report showed (after payment of the outstanding account for "Reports of District Associations") a debit balance of £22 19s.

The PRESIDENT moved, and Mr. MOTTRAM seconded, the adoption of the report and accounts.

Mr. H. KENDRICK (Stretford) remarked that he could not make the figures balance. According to the report, there had been an increase of three members; but the balance-sheet showed a decrease of £7 7s. in the subscriptions, which represented about fourteen members.

The HON. SECRETARY: Some pay in advance, and there are a number in arrear.

Mr. KENDRICK: Even taking this into account, there is still a difference of seven or eight.

The HON. SECRETARY: It should really read 205 members. I find I made a mistake of one.

The PRESIDENT: The accounts have been audited, so I presume there is a satisfactory explanation of the point raised by Mr. Kendrick.

The HON. SECRETARY: It is too bad of the members keeping back their subscriptions, as they do, until the last minute.

The report and accounts were then adopted.

REPORTS OF COMMERCIAL SECTIONS.

Mr. S. MEUNIER (Stockport), in moving that the report of the Lancashire Commercial Section be approved and adopted, said there had been a very heavy amount of work done during the year. Many important points had had to be taken into consideration; and he thought the work had been thoroughly well carried out. There had been some very fine attendances. In fact, the attendances seemed to be growing year by year. This was a healthy sign, not only of progress in the past, but as an augury for years to come.

Mr. KENDRICK seconded, and agreed with Mr. Meunier that a very considerable amount of work had been undertaken, not only of the ordinary routine kind, but in the way of explanation and discussion of the various Government proposals and orders put forward. The information that had been given by the members one to another had proved very helpful. He trusted that the progress which had been made the last few years, and the interest that had been taken in the work, would be continued, because, speaking from his own personal knowledge, he could affirm that the work done and the information imparted were of inestimable value to the undertakings which the members represented.

Mr. E. H. HUDSON (Normanton), who moved the adoption of the report of the Yorkshire Commercial Section, agreed that the discussions were of such a nature that they could not fail to be helpful to those who took part in them. The information elicited at the meetings was beneficial to every undertaking, and any who had not already joined should immediately come into the fold, so that the sections could do as was being done nationally—present a united front in any matters they might have to take in hand.

Mr. R. WATSON (Doncaster) said there was not the slightest doubt that the work done by the sections was of very great value to the undertakings represented; and those outside should at once take Mr. Hudson's advice to join. Time after time money had been saved by attending the meetings and getting information. Apart from the hints and help derived, it was monetarily worth the while of those who were not yet members to join without delay.

The reports were then adopted.

INSTITUTION OF GAS ENGINEERS' BENEVOLENT FUND.

The PRESIDENT said he had now to put before the meeting certain recommendations of the Committee. The first one was that the sum of £5 5s. be granted to the Benevolent Fund of the Institution of Gas Engineers. It would be seen from the statement of accounts that they had for the past two years—and he was not sure how much farther back—given a sum of £10 10s.; but the Committee regretted that they could not recommend the same amount on the present occasion. As everybody knew, expenses were increasing; and the financial condition of the Institution did not permit of such a large contribution to this and some other things they had occasionally given to. For one thing, they had had to knock off last year the donation to the British Commercial Gas Association. Though they felt it necessary to reduce the amount given to the Benevolent Fund of the Institution, this, of course, did not mean that the Committee thought that the fund was not worthy of all they could afford to give it.

The recommendation was agreed to.

MEMBERS' TICKETS.

The PRESIDENT remarked that the next thing to be submitted was the suggestion that, in order to save expense, the members tickets be not issued for 1919. Looking round to see how they could further curtail expenses, the Committee found that, under present conditions, the preparation of the usual members' ticket, giving the list of members, rules, and so on, was rather expensive. The cost was about £10 more than they had been accustomed to pay; and it was felt that, at any rate for one year, they might be omitted. Any new members would get the tickets already issued, so that they could make themselves acquainted with the rules. He moved this.

Mr. KENDRICK: Does it not point almost to the necessity of having to slightly increase the subscriptions, if you are going to cut all these things off? Because expenses will not fall to any extent within the next year or two; and you have got practically to "rock bottom" now. If you are going to continue the work of the Institution, you will have to raise the subscriptions or "send the hat round."

The PRESIDENT said the matter was having the consideration of the Committee; and probably a recommendation on the subject would be brought forward at a future meeting. It could not very well be done for this year.

The proposal was carried.

Representative on the Institution Council.

The President moved that Mr. Frith be appointed the representative of the Institution on the Council of the Institution of Gas Engineers for 1919-20. He pointed out that Mr. Frith had already acted in this capacity; and they all of them knew how well he had served their interests.

The appointment was agreed to, and acknowledged by the Hon. Secretary.

Representatives on the Junior Councils.

The President then proposed, and it was agreed, that Mr. S. Tagg and G. W. Fligg be appointed the representatives of the Institution on the Councils of the Lancashire and Yorkshire Junior Associations respectively.

The New President and the Old.

The President said he now came to a very pleasant duty, which was to ask Mr. Mottram to take up the position of President. As they knew, Mr. Mottram had been for some time working on the Committee of the Institution; and he had made his presence there felt. They had done well in appointing him President for this year.

Mr. Arnold E. Mottram, of Ossett, then took the chair, amid applause, and said his first duty was to move that the members tender their best thanks to Mr. Leather for his services as President during the past twelve months. They would all agree that he had made an ideal President. He had won the esteem and goodwill of every member of the Institution. For a long time now he had regarded Mr. Leather as one of the mainstays of the Institution. Whenever they had been discussing highly technical matters, Mr. Leather had taken a leading part; and he had always told them something which was very well worth listening to. During the past year, he had not only successfully carried out the duties of their President, but he had attended in London as their representative, and had devoted attention to the important question of refractory materials.

Mr. R. H. Ginman (Leek), in seconding, pointed out that Mr. Leather had done useful pioneer work with his vertical retort installation at Burnley.

Mr. Leather (when the vote had been heartily accorded) said he was much obliged to them all. It was with some diffidence that he took the first step which meant that they were in due course looking to him to be President; and when the time actually arrived, it was not altogether an easy year. It had been the last year of the war, and had proved a very strenuous time, not only—and perhaps not chiefly—as President of the Institution, but also in connection with his position on the National Gas Council. But though arduous, it had been very pleasant attending the meetings of the National Gas Council; and now that the Council were reorganized on a new basis, he had confidence in the future of this new and more vigorous body. He did not think Mr. Mottram's year of office would necessarily be a very much easier one than that which had just passed. There were still difficulties in sight, and they did not know what the future would bring forth; but he was sure Mr. Mottram would have the help of every one of them. He (Mr. Leather) would be glad to still work for the Association, though no longer as President.

Mr. Mottram then proceeded to deliver his

PRESIDENTIAL ADDRESS.

Our industry holds a proud place among the industries that were specially called upon in the time of greatest need; and we should not be diffident in making the fact widely known. We were called upon at a moment's notice to strip our gas of illuminants, and so provide explosives for the Army. The sudden change of quality caused some consumers a little inconvenience (owing to the adjustments required to the burners), which they accepted in good part when they understood it was to provide our men with the wherewithal to hold-up the foe.

Much has been heard of many industries making high profits at the expense of the taxpayer. The gas industry, however, certainly cannot be accused of this. The Government have paid us below market value, and have nearly smothered us under Defence of the Realm regulations. We have had to pay greatly increased prices for coal, materials, and wages; so inevitably the price of gas has had to be increased.

The war has proved how in the past the gas industry has been crippled by misguided regulations; and we must see to it that the fetters are not reimposed. Gas is a commercial commodity; and we must be allowed to take it into the open market against all competitors, and stand or fall by the demand for the most suitable commodity at the cheapest price.

History of the Ossett Gas-Works.

The Ossett Corporation purchased the Ossett Gas Company in 1901—paying £117,000 for a capital of £50,000. This created a large goodwill account, and heavy annual sinking fund and interest charges. For the first three years, the balance-sheet showed a loss. This loss was turned into a profit the fourth year, when we got the benefit of improved carbonizing results—due to the reconstruction of the retort-house—and an increased sale of gas, obtained largely by slot meters, free fittings, and pushing the sales of gas engines and cookers. When the works were acquired, the retort-house contained direct-fired hand-charged horizontals, to which all the coal had to be carted. The retort-house was reconstructed by putting in deep regenerators. The make of gas improved by about 1500 c.ft. per ton of coal; and this together with other economies, enabled us to pay off the cost of reconstruction in five years, and also reduce the price of gas.

In 1913, we were faced with the problem of having a retort-house in a somewhat cramped position, working to its full capacity, and a growing demand for gas. We had to decide whether to enlarge the retort-house, and make it more cramped, or abandon it and build a new one on land which was available. It is always a difficult matter to make up one's mind to scrap plant and to replace it with more modern plant. But it is often the wisest policy; and has proved so at Ossett.

Similar problems face all committees sooner or later; and from what one sees in many works to-day the bold and wise decision is often shirked. Possibly the idea prevails to let well alone and save money. To my mind, it is letting bad alone, and advertising the personal unfitness of the responsible members for the position of authority which they occupy. Every gas consumer has a legitimate grievance against them in such circumstances. Some time was spent by the Ossett Gas Committee in visiting different kinds of modern retort-houses and obtaining actual working results. Eventually it was decided to build a new retort-house with intermittent verticals, and lay a railway siding into the works.

Introduction of Verticals.

Five years ago, it was a bold venture to decide on verticals. They have, however, fully justified themselves at Ossett, and generally may be said to-day to have safely secured the claim which advocates marked-out for them. Their worth has been proved, and they have been instrumental to a large extent in spurring us all up to much higher makes per ton. We found, as a result of our investigations, that the capital cost of verticals and horizontals with the best charging machinery would be about the same; that the number of men required to work verticals would be fewer; that both the make of gas per ton and the yield of residuals would be greater; and that with verticals we should be free from naphthalene troubles.

At that time we were working hand-charged deep regenerator horizontals, and had twenty-four stokers in the depth of winter. Since we put in verticals, four stokers have made more gas than the twenty-four used to make. In these days of shortage of labour and high wages, this is no mean advantage. As wages will remain high, this phase of the question will call for more consideration generally. Before we put in verticals and the railway siding, all the coal had to be carted from the station or from the pits; then stacked in front of the retorts ready for hand-charging; and the coke had to be wheeled out and stacked. Now the coal is brought in by rail to the retort-house; the wagon is tipped-up on end; the coal is elevated into overhead hoppers, from which it falls into the retorts; the coke drops out at the bottom on to a conveyor, which delivers it into an overhead hopper in the yard; and from this it drops into the carts for sale.

We used to require six to eight stokers in summer, and twenty to twenty-four in winter. We now have only four all the year round; and by the increased make per ton obtained by verticals 3000 to 4000 tons of coal are saved per year. These are very large savings. Against them are sinking fund charges, interest on cost of plant, and extra cost of repairs to machinery.

The war has added so greatly to the cost of everything that we have had to increase the cost of gas; but if we had not made the alterations and saved in the way I have mentioned, the increase would have been greater.

Experience of the Working of Verticals.

I have now had a fairly lengthy experience in the working of verticals; and I am bound to say that the more I see of them the better I like them. The contractors for our plant (Messrs. Goodall, Clayton, & Co., Ltd., of Leeds) supplied first-class material and workmanship—leaving nothing to be desired in this respect. We were particularly fortunate in that the starting-up of the plant was in charge of Mr. Thomas Settle, who is undoubtedly a leading expert in carbonization. For the good results obtained, and the smooth working throughout, I give the highest credit to Mr. Settle for the excellent start he gave us.

In the past two years, steaming the charges in various systems of verticals has been greatly extended, with substantial increases in both gaseous and liquid products. In June, 1916, when coal became dearer, it occurred to me to try alternative distillation and steaming in equal periods of time. A fourteen days' test completed June 30, 1916, was as follows:

Coal carbonized, tons	225·7
Gas made, c.ft.	3,459,000
,, per ton	15,325
Average calorific value, total heat	519·6
Retorts charged	492
Coal per charge, cwt.	9·17
Total hours steaming	1370

The calorific readings were taken with a Simmance-Abady total heat calorimeter.

In a shorter test, purposely arranged under conditions of prolonged steaming, we obtained a make of 18,554 c.ft. per ton of 479·7 B.Th.U. calorific value. These figures have been confirmed in the excellent papers contributed at our past few meetings. Our method of steaming is the ordinary upward process; but I noticed in the "Gas Journal" for Nov. 12 last that Mr. Settle, with his "downward steaming" process, is getting even better results.

The working conditions of the settings are so well-balanced and standardized in areas and vacuums that our No. 2 bed ran for thirteen months with practically no alterations to the bench dampers or air-slides. The regularity of combustion and equal diffusion of heat through the settings ensures uniformity of temperature in the respective zones of the settings. The Centigrade

temperatures (taken by a standardized Wanner pyrometer) are as follows:

—	Divisions.						
	1	2	3	4	5	6	7
Combustion zone . . .	1200	1207	1210	1214	1207	1211	1196
Middle zone	1114	1117	1114	1120	1118	1114	1096
Top zone at the top of setting	1011	1014	1012	1018	1020	1012	985

[No. 7 division is the cool end next to the setting out of action.]

Owing to the shortage of coal, we have lately been steaming to get a make of about 17,000 c.ft. per ton of about 500 B.Th.U. calorific value.

The effect of the increase in wages, war bonus, &c., has sent up carbonizing costs all over the country. Being anxious to compare the cost at Ossett, I have obtained the costs of other intermittent verticals, and find they run closely together. I have also obtained the costs of a similar number of horizontals with hand-charging, and find the present average cost from "coal in store to coke in yard" is as follows:

Intermittent Verticals.	Horizontals, Hand-Charging.
£6 13s. 4d. per million.	£17 5s. per million.
1'60d. per 1000 c.ft.	4'14d. per 1000 c.ft.
2s. per ton.	3s. 11d. per ton.

SALE OF RESIDUALS.

Our industry has in the past not made the most of its residuals. Perhaps the word "residual" has something to do with it—giving the impression of a waste undesirable substance of little value; something that is, in fact, a nuisance. This is, I think, an opportune time to coin a new word that would serve to keep prominently before us the wonderful commodities obtained from the distillation of coal. We recover 12 to 14 cwt. of coke from every ton of coal carbonized in gas-works. Yet we are content to simply call it a residual, and wonder that the public set so low a value upon it. At Ossett, we advertise the coke, prepare it in suitable sizes, and deliver it to the public in large or small quantities, as desired, with the result that we sell the whole saleable production in our own district. Previously, we used to send hundreds of tons per annum away by rail at a low price.

Tar is another of our so-called residuals; yet it is one of the most wonderful substances known, containing an endless variety of valuable products. In the past we have been content to sell it at a low price, and let others grow rich at our expense. An attempt is now being made to remedy this by fixing up a profit-sharing scheme between gas undertakings and tar distillers. This is a matter of vital importance, and needs careful consideration. In arranging the terms, the fact should not be lost sight of that tar products are going to receive in this country the attention they merit, and, consequently, their cash value will be increased; so gas consumers should benefit accordingly. At Ossett for the past two years we have dehydrated all the tar produced, with the result that we have obtained about double the price per ton that the distillers offered for it in the raw state. The Corporation have recently put down a tar macadam plant; so that we shall probably sell the bulk of it in future in our own district.

Ammoniacal liquor, the third of our residuals, has received more general consideration. Many gas-works turn it into sulphate, with profitable results; but many more are content to sell it in the raw state at a low figure. In view of the fact that sulphate is in growing demand for home consumption, the question arises whether a profit-sharing scheme, for those who sell it in the raw state, is not worthy of consideration, on the same lines as is suggested for tar. During the war, when concentrated ammonia was in demand for munitions, we put down a plant to make it, with a view to turning it into a sulphate plant afterwards. This we shall probably complete as opportunity serves, and shall endeavour to sell the bulk of the sulphate in our immediate neighbourhood.

RECONSTRUCTION.

This is a prime product of the war, and one that concerns our industry equally with others. We used to be satisfied with the belief that our profits were made in the retort-house; but we cannot rest there. We shall still have to give the retort-house credit for the lion's share of the profits; but with the keener competition ahead, it has become more than ever necessary to control the gas to the burner. We shall first have to decide what calorific value is the best and cheapest for the consumers. To enable us to do this, we must join hands with the makers of gas-consuming appliances; so as to guard against the danger of fixing upon a calorific standard that will reduce the cost of manufacture and at the same time increase the consumers' gas account. I am a believer in good quality coal and a large make per ton; and for the past few years I have succeeded in obtaining what has been considered a big make—14,000 to 15,000 c.ft. per ton. That is not now sufficient; and I think the probable standard will be about 20,000 c.ft. of 450 B.Th.U. calorific value total heat. [I use the term total heat, as it is something that everyone can understand, and much simpler than gross or net.]

In arriving at the standard we must not lose sight of the many things that enter into it. If we went in for a very large make of a low quality, we should at once be faced with the question of the capacity of our distributing mains and services, and should either have to enlarge them, or greatly increase the pressure at the works, with a corresponding increase in our leakage account. Again, the large make would have to reduce the cost more than enough to cover the consumer for the extra quantity he would burn to meet his requirements. Taking these points into consideration, I think the figures mentioned are practicable. Our present mains will distribute this quality, appliances can be adjusted to it, and future appliances be constructed to burn it and yield the highest efficiency.

Having got our gas and gas-consuming appliances, we must then bring them in no half-hearted manner to the consumer. There is already a good foundation in the British Commercial Gas Association. Joint action is far more effective than individual effort. Experts might be engaged to devote their whole time to the work, and be available to advise any member as required. Next comes the necessity for competent men to fix the appliances, and, when fixed, to follow them up and see that their efficiency is maintained. This brings us to the question of the training of gas-fitters. A start was made in this direction a few years ago; but the war has greatly interfered with the work. We must now resume it with renewed vigour, and give it the attention it demands. Gas showrooms that have been neglected during the war should now be rejuvenated and replenished. We should persuade our consumers to visit them, give them a practical demonstration of the advantages of domestic gas appliances, and follow up their sale by a system of maintenance; so that every article sold shall act as an advertisement, and set up a snowball system of sales.

We should give every attention to factors that militate against, or in favour of, cheap gas. Dilapidated plant is a luxury we can no longer afford. Labour-saving appliances, in view of the high wages which have come to stay, will be more essential than ever, and can be put in without injury to labour; for work is likely to be plentiful for some time to come.

Parliamentary restrictions that have crippled our expansion for so long, and have been advantageously suspended during the war, must be washed-out. The gentlemen at Westminster whose duty it has been to handicap us, should be educated up to the standard capable of taking an intelligent interest in an industry vital to the health and wealth of the State.

The system of taking large sums from gas profits in aid of the rates should be called by its proper name and stopped. I have never heard any defence of it worth listening to, and gas will be cheaper in many towns when this is done away with. I agree that the gas undertaking should pay its fair share towards the standing charges for cost of administration. But so far, and no farther. At Ossett I am not troubled in this direction, for one of the local authorities we supply has a clause in our Act which gives them power to ask for the price to be reduced if we charge more than a certain price and make a surplus profit.

Another way in which gas could be cheapened, in many cases, would be to link-up one or two neighbouring works; so that in summer time, instead of having two or three works, working with half a load, one could work at full load, and supply into the holders of the others by means of a high-pressure main. If we are in earnest in trying to cheapen gas, I do not see any insurmountable difficulties in the way of something of the kind being attempted; and it is a matter that might well receive careful consideration. A modern carbonizing plant, working up to its full capacity, runs much cheaper per 1000 c.ft. made, than the same plant working only half its capacity. The linking-up of neighbouring works would have many more advantages. We should each have a stand-by that would be very useful in emergency; we should also be able to carry out repairs and alterations under more advantageous conditions, as it is often difficult to carry them out when one has possibly very little room, and has to keep on working. Men who were not for the time being required inside the works could be employed for the development of the outside department.

If the State takes over the railways and the collieries, we may expect it will be our turn next; and from what we have seen of State control, it is not an encouraging prospect. If it does come about in our case, it will probably be on the grounds of the conservation of coal. The eyes of the public have been opened to the value of coal, and to the way in which it is wasted when burnt under a steam-boiler, or in the domestic fire-grate; and if we do not do our best to bring about the more general use of gas instead of coal, the State may step in and do it for us. To my mind, speaking generally, coal should not be allowed to be burnt till the valuables it contains have been distilled out of it; and the best place to do this is at the gas-works. The development of these valuables should be our chief consideration in the near future; and gas should be distributed and sold at the same price, and in the same way, that water is at present supplied.

I contend that gas-works will be the better managed by their present owners than they would be if taken over by the State. If the State would help us to develop our industry on the lines I have mentioned, I see no reason why gas should not be sold at a very cheap rate. Cheap gas would mean that electricity would be generated by it. Steam-boilers would be fired by it, houses would be heated by it, the smoke nuisance would be done away with, the saving in coal would be very substantial, and all its valuable products would be recovered.

We hear of the proposal being strongly revived of generating electricity on a very large scale at the pit mouth. If this is done,

surely the coal will first be carbonized and the residuals recovered. The capital charges on scores of miles of unremunerative cables will be a serious drawback to such a scheme. It seems more feasible for the gas-works and electricity works to supply one another at a cheap rate, and to develop side by side. Both are in demand, and have come to stay; and experience shows that where electrical competition has been the keenest, the gas-works have grown the fastest.

The National Gas Council might draw up an educative report and submit it to Parliament, suggesting the lines on which gas should be developed. We look forward to the Parliament of the future being a much more business-like body than that of the past. Consequently, we should quickly set about helping them to help us, and at the same time to benefit the gas consumers, who represent the great majority of the inhabitants of these islands.

CONCLUSION.

I cannot conclude without thanking you for the honour you have done me in electing me President of this, I believe to be, the premier District Institution of Gas Engineers. The year 1920 will be our Jubilee year; and no doubt arrangements will be made for celebrating the event in a manner worthy of the Institution, and the importance of the event.

The Future Quality of Gas.

Mr. R. E. Gibson (Liverpool) said the President had given them a large amount of his experience in connection with his own undertaking which would be very valuable to the members of the Institution. Had it been customary for the Presidential Address to be discussed, there were many matters that would have formed subjects for profitable discussion. Mr. Mottram was to be congratulated on the great saving effected by the introduction of verticals at Ossett. It was a credit both to him and to his Committee. In the address, he had touched upon the subject of reconstruction. They were all greatly interested now in this matter, and heard a lot about it. One thing they were particularly anxiously awaiting, was to hear what was to be the future quality of gas. Mr. Mottram had suggested 450 B.Th.U.; and he (Mr. Gibson) hoped it would be somewhere in this neighbourhood. The address would repay careful study and thought, as there were many helpful suggestions in it. He had great pleasure in proposing that their very best thanks be tendered to the President.

Mr. T. Duxbury (Oldham), in seconding, said they were much indebted to Mr. Mottram for the straightforward way in which he had expressed himself. He had given it "straight from the shoulder;" and the hints he had thrown out would bear investigation. He liked the address the more because Mr. Mottram had not "beaten about the bush." In speaking of the calorific value of the gas, he quite agreed with the President that it ought certainly not to be more than 450 B.Th.U. They had all had experience of 450 B.Th.U. gas in the last two or three years; and he thought most of them were of opinion that this quality of gas could be made quite suitable for any kind of gas consumption in a town. He was even prepared to go a bit lower than Mr. Mottram. He believed if they got in the neighbourhood of anything between 400 and 450 B.Th.U. they could make a gas which, though the consumer might have to use more of it, could he manufactured at such a price as would enable them to give the consumer a benefit. Of course, in speaking to a resolution like this, one felt a little bit tempted to discuss the address. There were many points which could be discussed, but most of them in a manner favourable to the President.

Education of Gas-Fitters.

One matter that had been touched upon was distribution. Their friend Mr. Kendrick had for many years taken great interest in the question of the education of gas-fitters—a subject which would certainly come much more to the front than had been the case hitherto. It was a branch of their work which, though some might not think so, had been neglected. Till they got some recognized method of educating gas-fitters from boyhood upwards, so that they would take a keen interest in the work they had to do, it could not be expected that the success of the distribution side would be what they would like to see it. They might get excellent results on the works, but unless they had a distribution department which was likely to get the best possible results out of the gas after it was made, he thought they would fail. As Mr. Mottram had hinted, they would have great competition to face in the future. If the electricity scheme should go on backed-up by the Government, they would have to pay a great deal more attention to the distribution side of their work, as well as to manufacture. He hoped that, as Mr. Mottram had suggested, now that the war was over, those who had taken special interest in this matter—and more particularly Mr. Kendrick, who had had it very much at heart—would persevere in their work. It was a branch of the industry in which there was great scope, and which would amply repay any effort that might be put into it. Much material would be found in the address to guide them to greater success in the future.

The President, acknowledging the cordial manner in which the vote had been received, said it had occurred to him that possibly there was an apology due to the members for the shortness of the address; but he had been put into the chair a year earlier than he had expected, and had not had as much time to give to the matter as he would have liked. So, under the circumstances, he thought the best thing he could do was to make it "brief and breezy." He might say that the reason why they had not met on the previous day was that they could not get a room in Manchester. His Chairman had very kindly come with him to the meeting; and he was sure they would like him to say a few words.

An Invitation to Ossett.

Alderman Robinson (the Chairman of the Ossett Corporation Gas Committee) said his first words must be to congratulate Mr. Mottram on his election to preside over a very important body. Evidently, somebody besides the Ossett Corporation had an idea of Mr. Mottram's qualities and worth to the gas industry. He had listened with great interest to the address, though the details of it were quite familiar to him, for he happened to have been Chairman of the Gas Committee for fourteen years. Mr. Mottram had proved at any rate one quality which he (the speaker) had not thought he possessed. The address displayed literary merit; and this was the last thing he would have suspected the President of. [Laughter.] He had, however, not only demonstrated his good qualities, but he had exhibited some deficiency. He had told them it was time the gas industry coined a word. With this, he (Alderman Robinson) fully agreed; but he would have thought the President was the man to coin it. In this he showed his weakness. Mr. Mottram said the system of taking large sums from the gas profits in aid of the rates should be called by its proper name. He would like him to tell them what this name was; for, of course, he was interested on the other side, though in Ossett they were not guilty of the bad practice referred to. No doubt it was a bad practice, and one which in the past had been detrimental to many undertakings. He not only congratulated Mr. Mottram upon his election, but he congratulated the Institution on having elected him. They got to know each other's characters and qualities secretly; and he had overheard in London a few days previously this Institution described (though he did not know by whom) as a "moribund institution." However this might be, he did think the Institution needed a little more go. It required a little more activity and enthusiasm, a little more initiative, and a little more enterprise. If the Institution displayed more of these qualities, it would be doing all it ought to do for the great gas industry of the country. He urged them individually to give diligent attention to the scientific and technical side of the gas profession, and to take greater interest in the science of gas distribution—for undoubtedly it was an art and science which needed cultivation. Another matter to which they ought to give attention was the commercial side of their undertakings. They had simply made the gas, and left it to people to take it or leave it as they thought proper. A little more enterprise and enthusiasm on the commercial side was needed. He was sure they would take what he had said in the best part, and that, so far as it might be worthy of attention, they would give it the best possible consideration. Before resuming his seat, he wished to tell them that, having discussed the matter with his Committee, they would be pleased to receive at Ossett the members of the Institution, at a time convenient to themselves, to inspect the gas-works. The Committee would cordially welcome all the engineers; and he would urge them to bring their chairmen with them—because the chairmen needed educating a little as well. They must come in the greatest possible numbers; and so far as the Ossett Gas Committee could do it, they would see that the visitors had a very good time.

Mr. Leather said they were delighted to have Alderman Robinson's invitation to visit Ossett, and would certainly accept it at a convenient time, during Mr. Mottram's term of office. He did not know that it was for him to make any reply to Alderman Robinson's criticisms. Of course, they took them all in good part. As an Institution, they did not think themselves entirely moribund. On the contrary, they regarded themselves as the most lively of all the institutions of the country.

Thanks to the Officers.

Mr. Watson proposed a vote of thanks to the Committee and the Hon. Secretary, Treasurer, and Auditors. He said he had always been peculiarly pleased to be a member of the Institution; and he remained proud of his membership, in spite of the remark of Alderman Robinson, that they were supposed to be in a moribund condition. If this gentleman would look through the "Proceedings" of the Institution for the past dozen years or so, he would not find much justification for the remark he had overheard in London. The work done by the Committee from time to time had been of very considerable importance, not only to the Institution, but to the industry as a whole. During the past year they had had a good many matters of a topical character to deal with; and they had done their duty well. Of individuals, he need not say much. To Mr. Frith they were greatly indebted; and to the Hon. Treasurer (Mr. T. Banbury Ball) they also owed their thanks, as well as to the Auditors.

Mr. J. W. M'Lusky (Blackburn), who seconded, said he wished personally to congratulate the Committee on being able to show a reduction of 30 p.ct. in expenditure. It was a most refreshing balance-sheet.

The resolution was cordially passed.

Liquid Fuel.

The "Journal of the Royal Society of Arts" translates an account given by M. Guiselin, in "Mémoires de la Société des Ingénieurs Civils de France," of various methods of obtaining and preparing marketable liquid fuel from all sources—such as oil from wells, from shale, from coal, from lignite, and from peat. The recent steps taken in France to improve her own sources of supply are considered in detail. There are extensive deposits of oil-shales in France, which are on the eve of being exploited. A special horizontal cylindrical retort has been devised, and is said to give an excellent yield. It contains a slowly rotating screw, which pushes the shale from one end to the other. The temperature does not exceed 500°C.; and the spent shale, which contains a certain amount of carbon, falls from the retort into a producer, where it makes ordinary producer gas. The extraction of oil from bituminous coal is described; and some experiments are quoted showing the importance of removing the gas and oils from the retorts at the various stages as they are produced, so as not to expose the light oils to high temperatures. The gas is recirculated; and by the consequent reduction to partial pressure the vaporizing of the oil takes place at a lower temperature than without recirculation. Thus the same quantity of oil is obtained at a temperature of 400° as otherwise would require 500° The results of experiments in this connection are given in tabular form.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the members of the Midland Junior Gas Association was held last Thursday evening, at the Birmingham Council House—Mr. T. H. Poulson (the President) in the chair. There was a very good attendance of members to hear a paper read by Mr. W. A. Twine.

The President gave a cordial welcome to the members and to Mr. R. J. Milbourne, the General Manager of Messrs. C. & W. Walker, Ltd., of Donnington.

Dehydration Processes for Various Tars.

Mr. Twine then read his communication on the above subject. The paper, together with the discussion to which it gave rise, will be found on p. 462.

FUEL SAVING IN FURNACES.

The object of a lecture delivered by Mr. C. M. Walter, M.Sc. (the Engineer-in-Charge of the Industrial Research Laboratories of the Birmingham Corporation Gas Department), at a recent meeting of the Birmingham Section of the Institute of Metals, was first of all to describe the principles on which the various forms of muffle and oven furnaces usually met with in practice operate, and secondly to compare the relative merits of each particular type of furnace for a given process—and incidentally to outline the direction in which developments are likely to take place.

After making a brief reference to the meaning of combustion of a fuel, Mr. Walter went on to say that the production of high temperature industrially is wholly dependent on the pre-heating of the air and gas, or both, either by recuperation from the waste gases or independently. This pre-heating was first employed by Sir William Siemens in 1860, and the same system of regeneration (or a modification of it) has since been employed in almost every instance where high temperatures are required. Owing to the enormous advantages to be derived from the application of the gas-fired recuperative type of furnace—even for the more moderate temperatures—its use is fast gaining favour.

The next section of the lecture was devoted to a description of the various parts of a furnace. Speaking of direct-fired furnaces, he remarked that, despite the low working efficiencies usually obtained with this type—amounting in many cases to not more than 5 p.ct.—a very large number are still employed, owing to simplicity of construction, low first cost, and ease of manipulation. But in the majority of cases where they are used for working temperatures above 800° C., a fuel economy of not less than 30 p.ct. could be effected by the employment of a gas-fired furnace with recuperation. The operation was explained of gas-furnaces with single or double recuperation; and then the lecturer proceeded to deal with furnace efficiencies. He said that the efficiency of a furnace has for a long time been a much vexed question; and even to-day it would appear that a satisfactory basis on which the performances of different makes of furnaces can be compared has yet to be formulated.

When speaking of efficiencies, one usually is interested in the efficiency of the operation carried out in the furnace, which will be the ratio of the heat usefully employed in the heating of the work to the total heat supplied. However satisfactory this may appear from a practical point of view, it does not provide a basis on which the efficiency of the furnace from the point of view of total heat utilized in the working chamber can be computed, as it will easily be understood that the working efficiency will depend both on the nature of the load and its character and distribution—or, in other words, on the nature of the load with regard to its conductivity for heat.

One basis which has been suggested, and which would appear perfectly rational, is the efficiency obtainable on a basis of the total heat utilized (irrespective of whether it is employed for heating work or for overcoming the conduction and radiation losses in the working chamber), compared with the total heat supplied by the combustion of the fuel—this forming a basis which is independent of the nature of the load, and which, for a given type of furnace, has many advantages, as it gives a true representation of the percentage of heat which is imparted to everything within the furnace chamber, including the heat radiated or conducted from the brickwork chamber itself. This can be estimated from a knowledge of the calorific value of the fuel and the temperature and composition of the waste gases at the outlet-flues from the heating chamber. Where the efficiency is based on the heat expended in doing useful work, it is absolutely essential that, in computing the total heat given up to the work, the total heat of the particular material over the working temperatures employed be used, instead of the product of the specific heat at ordinary temperatures and the rise in temperature, as the latter estimation does not take into account the increase in the specific heat of the metals at the higher temperatures, and is likely to lead to very serious errors.

The lecturer then referred to furnaces employing town gas or other high-grade gas. He said that where the heating pressure is a continuous one occupying long periods, and involving a continuous running of the furnace day and night—as in the case of such work as annealing strip metal, billet metal, and other similar processes—it becomes imperative to employ a furnace designed primarily for high fuel efficiencies. Reference was made to a test recently carried out by the author on such a furnace, 54 in. long by 32 in. wide by 24 in. high (interior) made by the Davis Furnace Company, in which he obtained a figure of gas consumption per hour per pound of load (steel billets), maintained at 825° C., of 0·35 c.ft. With the furnace, temperatures over 2000° C. have been secured, and a figure of efficiency constituting the ratio of—

$$\frac{\text{B.Th.U. employed in doing useful work}}{\text{Total B.Th.U. supplied}}$$

of nearly 40 p.ct. was obtained. The efficiency given is a figure of working efficiency for one particular condition of loading.

It would be seen, Mr. Walter said, that in this direction lies an enormous field of development of the furnace fired by town gas; and if it were possible to obtain gas of a calorific value of 500 B.Th.U. per cubic foot from the town mains at a figure approaching 1s. per 1000 c.ft., even in the case of furnaces of large dimensions there would be no justification for the employment of producer plant, owing to the enormous advantage to be gained by the use of such a fuel, and the reduction in the working costs due to the handling of fuel, firing, and cartage of ashes, which obtain in the case of other systems, to say nothing of the huge advantages to be gained from the simplicity of operation, ease of temperature control, and the cleanliness of the work.

Another application of town gas for heat-treatment work, said Mr. Walter, is the firing of tubular furnaces; and for furnaces of this type of moderate size, it would appear that this form of firing is likely to be one of the most economical for the purpose, when used with recuperative and regenerative settings. The heating of a fire-clay tubular furnace uniformly for a considerable length with a series of gas-burners has in many instances been an extremely difficult proposition; but the employment of a large number of separate combustion chambers, each capable of independent control, and provided with proper arrangements for pre-heating the air, would seem to a great extent to overcome many of the troubles which have hitherto presented themselves in this connection.

In heating a tubular setting, due allowance must be made for what may be called "cold-end effect," which may be explained as the cooling-down of the extremities, due to the increased radiation losses in these zones. But it will be easily understood that, if the furnace is designed with a large number of combustion chambers, each capable of independent control, these heating losses may be compensated for to a very considerable extent, and in this way a uniform temperature over a long length of tube heated can be obtained.

In selecting a type of furnace which is to be the most efficient for a given operation, the decided factors must be, first, the nature of the work; secondly, the working temperature or range of working temperatures; and, thirdly, the facilities for obtaining fuel. If, for example, the working temperature is below 500° C., there will be little to recommend the recuperator over the direct-fired; while with temperatures of 1000° C. or more, there is no doubt that some form of recuperative furnace will lead to an enormous saving in fuel. If the working temperatures are of the nature of 1500° to 2000° C., it becomes a question as to whether double or triple recuperation should be employed. But such questions as this will have to be decided by very careful consideration of the process from all points.

In conclusion, the lecturer referred to the lines upon which developments are likely to take place. He said that, in the case of the direct-fired furnace, there is little doubt that any improvements in fuel efficiences will only be obtained in the direction of more complete combustion, the least possible excess of air, and, further, by the employment of pre-heating chambers, steam-boilers, or other organs of recuperation, all of which make possible the increase of fuel efficiency in a furnace of this type. With regard to gas furnaces generally, the key-note of success so far as fuel economy is concerned depends almost entirely on the question of recuperation. This applies both to furnaces fired from producers and to those using town gas. Just as the manufacture of gas or steam engines is required to furnish a complete heat-balance, showing working efficiences, so it is equally as essential that the furnace-maker should be encouraged to supply thermal balance-sheets, showing the extent to which the heat of the fuel is utilized, and also the heat losses in various directions. Only by such conclusions would it be possible to increase fuel efficiencies by careful investigation as to where the heat losses occur.

Importation of Dyestuffs Prohibited.—A proclamation has been made prohibiting the unlicensed importation of coal tar derivatives capable of being used as dyestuffs, and all synthetic colours, dyes, and stains. The prohibition is, however, not to apply to any such goods which are imported under licence of the Board of Trade. For the present, a general licence has been given for the import of all dye-stuffs and other products covered by the prohibition which are of *bona-fide* French, American, or Swiss origin; and it will therefore not be necessary to obtain licences in respect of individual consignments proceeding from these countries. Communications regarding the prohibition should for the time being be addressed to the Secretary of the Trade and Licensing Committee, Dyes Department, Board of Trade, No. 7, Whitehall Gardens, S.W.

DEHYDRATION OF VARIOUS TARS.

GAS-WORKS TAR.

By W. A. Twine, A.I.C., A.M.I.Mech.E.

[A Paper read before the Midland Junior Gas Association, Feb. 27.]

Now that the war is over, it is necessary to devote our attention to items which will benefit mankind in general. To those of us in the gas industry, there are many things for us to do; and not the least important is that of supplying proper material whereby the roads of our country will be a credit, rather than a disgrace as they are at present.

We read a few weeks ago that the Government were allowing the sum of £10,000,000 for road construction and improvement. Much of this money will find its way into the purse of the gas industry in payment for prepared tar, pitch, and oils obtained from the tar of our gas-works. There are upwards of 180,000 miles of roads in England, Scotland, and Wales, all of which ought to be so constructed that, with our present-day traffic, little inconvenience should be experienced from dust.

We may divide our methods of bituminous road construction into three classes: (1) Tar macadam, (2) bituminous grout, (3) tar sprayed. The great advantage of roads so constructed is that poorer quality stone can be employed when mixed with tar, so long as the top surface is really good. Properly constructed and tar-treated roads are maintained at much less cost than the ordinary macadamized road, because scavenging, repairs, and watering costs are markedly reduced.

Owing to the great variation and properties of tars, different results have been obtained in road construction; but for many years past tars have been bought on specification. Generally speaking, little difficulty need be experienced by the gas engineer in conforming to a specification, even though tar varies very considerably according to the temperature of carbonization, shape of retort, quality of coal, &c. It cannot be claimed that all gas tars (even when dehydrated) are suitable for road work whether it be spraying, tar macadam, or asphalt mixing, owing to large quantities of naphthalene in the tars; but while there are difficulties, it behoves every gas engineer to sell as much good tar as possible

Gas Tars as Fuel for Engines.

It is only during the past few years that coal tar has been used for heating purposes on any large scale. While certain oils are used for engine fuel, the oils used for Diesel engines until recently were exclusively petroleum and shale oils, which were specifically lighter than water, distilled without residue and had a gross calorific power exceeding 18,000 B.Th.U. per pound, contained more than 10 p.ct. of hydrogen, and were free from suspended solid constituents. On account of the care with which they were ignited, they were regarded as proper fuel for Diesel engines.

Recently, however, coal tar oils which were less than half the price of petroleum oils have been much used. They comprise about 30 p.ct. of the original tar, are heavier than water, and generally distil without residue. Their calorific value is about equal to the tar. They contain much less hydrogen than gas oils, but ignite less readily. So 3 p.ct. of petroleum oil is admitted in front of the charge of tar oil with perfect success.

Vertical retort water gas, and oil gas tars approximate in their properties to coal tar oils; and in a short time we may expect to see these tars used directly in the Diesel engine. The present objection against horizontal and inclined retort tars is that the higher proportion of solid constituent precludes their use for such engines. For these purposes, the calorific power and the ultimate composition will become important. Tests that are necessary are for: Specific gravity, flash point, temperature of ignition, consistency when cooled, water content, ash, gross and net candle value, ultimate composition, yield of coke and free carbon, and naphthalene. As regards physical properties, horizontal tars have the higher specific gravity, while vertical tars have the lowest specific gravity.

To obtain better results, the engineer would do well to always try and arrange for a speedy separation of the tar and liquor at the hydraulic main. It can be proved that if hot tar (especially with a high free carbon content) is allowed to cool in the presence of water, it absorbs a great amount of the water, and forms an emulsion which is very difficult to separate. The tar, if run from the tar-tower into the bottom of a collecting tank fitted with a steam-coil to raise the temperature of the tar to about 120° Fahr. will generally contain less than 3 p.ct. of water. It is advisable to make provision for the removal of the collected water by fitting an overflow near the top of the tank, while the tar is drawn off at a lower level.

Another point to watch is that no oil—especially tar oil—is allowed to mix with the tar. Otherwise, under certain conditions, great trouble may be experienced, and emulsification take place—thus making it much more difficult for the tar distiller to obtain water-free tar for his stills.

Three months ago, I took a sample of tar which in the works' well contained 5·3 p.ct. of water. To 250 c.cs. of this tar I added 250 c.cs. of water well shaken in a separating funnel and allowed to stand three days in my office. Then 100 c.cs. of the tar which had separated was tested for water, and it showed 5·8 p.ct. To another 250 c.cs. of the tar I added 125 c.cs. of water and 125 c.cs. of special wash-oil. This was also shaken, and allowed to stand for three days before testing. But it was obvious that separation had not been as in the first sample; and, on distillation, the tar proved to contain 18·6 p.ct. of water.

Free carbon and pitch oils play an important part in tar quality—particularly its water content. Coal gas leaving the retort begins to condense out tar and liquor in the hydraulic main; and even under proper conditions the tar will contain from 5 to 10 p.ct. of liquor. On settling in the well, about half this amount will float to the surface. If, however, the tar is low in oils of pitch, then it is quite possible to find the tar will contain over 20 p.ct. of water; and it is only with great difficulty that the water can be separated even on using a steam-coil in the tar.

Some years ago, M. Ch. Ab-der-Halden carried out some very interesting work on the isolation of high boiling compounds, which decomposed or polymerized before 350° C. was reached, and resulted in free carbon being formed. These oils are a product of coal carbonization, and vary with the nature of the coal and also with the method of carbonization.

To prove the effect of these oils on tar, I have made some experiments with different samples, and you can see by the results before me how "hydration" is effected:

No. 1 is an average sample of tar which contains

8·7 p. ct. of free carbon.
6·5 „ oils of pitch.
5·3 „ water.

No. 2.—The tar when mixed with an excess of water and allowed to stand for seven days at a temperature of 38° C., will separate as No. 1.

No. 3 represents No. 1 after the oils of pitch are removed.

No. 4.—Same as No. 3. When mixed with an excess of water and allowed to stand for seven days at 38° C., the result is an emulsion containing 38·5 p.ct. of water.

I am of opinion that if we could control the amount of these peculiar oils, then our difficulties of tar emulsion would be solved. We know that free carbon is found in varying amounts in tar from below 1 p.ct. to over 30 p.ct. Most of it is present as an emulsion, it cannot be filtered out, this condition allows water to separate, owing to its specific gravity, or if heated to the difference in coefficient of expansion between the tar and water.

If, however, there is a shortage of oils of pitch, then the free carbon particles in the tar act as nuclei for water globules, which will not separate on standing. Much agitation and heat are required before the moisture is expelled; and then it is at times evolved with explosive violence.

For upwards of twenty years, I have had charge of, and have been interested in, dehydration plants for different sorts of tar. There are many plants which have been patented both at home and abroad which I have not seen but are worth mentioning.

1. Tar is sprayed into the upper parts of a steel tube, wherein it meets with an ascending current of hot dry air.

2. Tar is heated to 120° C., and centrifuged by means of two or more concentrically arranged drums pierced with holes as small as possible; while a current of heated air passes through the space between the drums, and encounters the particles of finely-divided tar. The vapours are withdrawn by fan.

3. Tar is heated to a temperature of 110° C., and is projected against a turbine-wheel which causes the tar to be atomized, after which it is allowed to flow down a tower in which a central shaft tube is kept revolving by means of the turbine. The shaft has blades attached which beat the tar as it flows down in zig-zag steps, owing to projections from the sides of the tower. The dehydrated tar runs off at the base, while vapours are drawn off at the tower top by fan.

The plants which I have worked with success include: (1) Pumping of tar under pressure through heated tubes into a large cylindrical vessel, on which a vacuum was maintained. (2) Pumping tar over steam-heated trays in a 30-ft. cylindrical vessel under a slight vacuum. (3) Ordinary boiler shells fitted with steam coils. Filling a boiler with wet tar, and heating-up by coils, allowing the tar to separate from the water. (4) Dehydration by centrifugalling (quite a failure at Nechells). Tar dehydrator which consists of an inverted cone fitted with helical channel. The vessel worked under a vacuum of 25 in. of mercury. (6) Hird, Hammond, and Chambers stills.

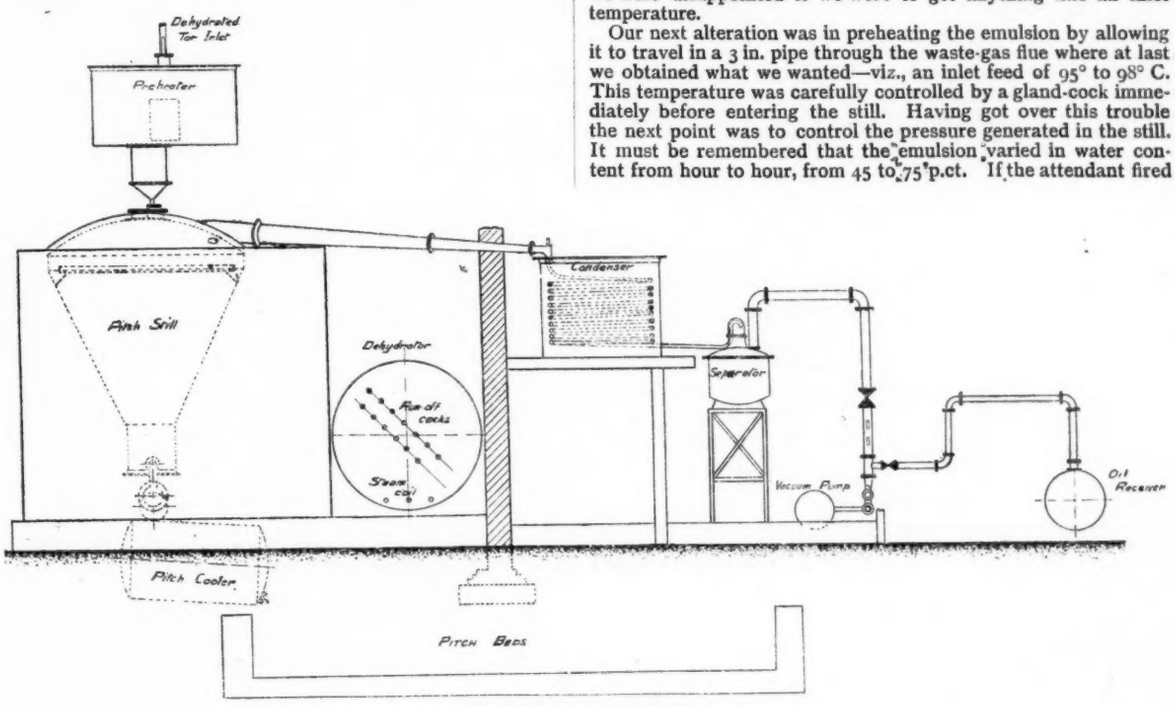
The two latter plants I will describe, because I think they will prove of interest, seeing that they have been working for some years past on tars quite out of the ordinary running. I must take the opportunity of thanking Mr. Chaney (the Engineer of Saltley) for permission to describe plant No. 5, and Mr. Tomlinson (the Engineer of Nechells) for his sanction to my giving particulars relating to No. 6; also to the Gas Committee for their permission to describe our plant.

In 1912 the Birmingham Gas Department, keeping up the City motto, "Forward," decided to instal coke-ovens for coal carbonization at the Saltley works. The ovens are heated by outside producers of the Mond type. This part of the plant embodies all modern improvements. The plant is capable of gasifying 112 tons of fuel (coke dust and slack), and is provided with a complete installation for the recovery of bye-products and for the regeneration of the steam. The gas on leaving the producers passes through a superheater, round which circulates the saturated air-blast on its way to the producer. It then passes to a mechanical washer, fitted with revolving "dashers," where it is washed with a fine spray of water, separating a portion of the dust and tar.

From the washer the gas passes into a similar piece of plant, which is used as an ammonia absorber; thence to two gas cooling towers; and finally through tar fans and sawdust scrubbers for the elimination of the last traces of tar.

During a period of twenty-four hours there are collected about 1200 gallons of very poor quality tar, which after separating from the cooling water in a semi-solid and highly viscid mixture shows over 25 p.ct. of water, though it is not unusual to find the water content as high as 40 p.ct. This tarry mixture is run into two 30 ft. by 7 ft. 6 in. steel shells, fitted with steam-coils, and allowed to stand, when the water content is reduced to about 7·5 p.ct. The tar is then blown up into a preheater prior to being run into the inverted cone still. Originally the still was designed and fitted with a V-shaped helical trough, so that as the tar entered the top channel, it took a winding course round and round the still, finally falling into a tank at the base in the form of pitch.

Owing to the great variation in composition as regards water and oil, it was found impossible to use the apparatus as a continuous still. The channel, too, got blocked with residue and quickly corroded. It was, therefore, decided to work it as an intermittent still by charging about 120 gallons of the tar on to a distributing dish (as shown in the sketch) every hour for about six hours. By this time the still contained 700 gallons; and the bulk of tar measured about 90 inches from the still base. A continuous firing is maintained, while the water vapour and oils are drawn off at a swan-neck by a vacuum pump which keeps a pull on the still equal to 25 inches on the mercury gauge. Distillation is continued until the sample taken from the still shows pitch to be of right quality as regards melting point.



MOND GAS PITCH PLANT.

The vapours are condensed in a wrought-iron coil; afterwards passing through a sight-glass and separator. Oils are run into the storage tanks, while the water is run away. The pitch is run off from the still bottom into a cooler, and finally into the pitch bays. The results of the plant working are as follows:

1000 gallons of tarry mixture, sp. gr. 1·050 from the Mond plant.
Separate 175 gallons of water in the steam-coil boilers.
Separate 25 ,, ,, ,, preheater.
Yield 50 ,, ,, from the still.
,, 182 ,, oil from the still.
,, 5677 lbs. of pitch as residue.

Test of Oil. Sp. Gr. 1·001 Distillation Test.		Test of Pitch. Sp. Gr. 1·21	
Water	2·7	Twisting point	58·5° C.
Up to 170° C.	2·75	Softening ,,	80·7° C.
170–230° C.	20·8	Melting ,,	89·0° C.
230–270° C.	41·5	Volatile matter	83·2 p.ct.
270–370° C.	28·8	Ash	0·2 ,,
Over 370° C.	3·4	Free carbon	13·7 ,,

At our Nechells works, we had about 1,750,000 gallons of water gas emulsion, which had accumulated for a number of years previously. On analysis, it showed: 58 p.ct. of water and 3·8 p.ct. of oils up to 175° C. Several attempts had been made to work it up, but without success. Among methods we have tried, the following may be mentioned: Direct heating; steam-coil heating; centrifuging; mixing with other oils and tars; and salting—*i.e.*, mixing it with a strong brine solution so as to separate it by coefficient of expansion, and at the same time alter very considerably the gravity of the watery portion. This method gave fairly good results; but, owing to the expense of contaminating the tar with sodium chloride, it was given up.

Owing to the large percentage of coke dust powder, the centrifugal machine was almost immediately choked—thus making it an impossible working proposition. It was, therefore, decided to instal two stills of the Hird, Hammond, and Chambers type. It was quickly found, however, that many problems would have to be surmounted before success could be claimed. The contractors supplying the plant realized our many difficulties, and were very willing in carrying out several structural alterations to enable us to get better results.

Owing to the enormous quantity of water present in the emulsion, the rate of feed compared with the dehydrated tar run off from the second still did not allow the preheater to raise the ingoing emulsion to a sufficiently high temperature.

After various trials and alterations, it was decided to cut out the preheater supplied, and try preheating by means of the heat given up by gases evolved from the still into the condenser together with the heat given up by the dehydrated tar. Again, we were disappointed if we were to get anything like an inlet temperature.

Our next alteration was in preheating the emulsion by allowing it to travel in a 3 in. pipe through the waste-gas flue where at last we obtained what we wanted—viz., an inlet feed of 95° to 98° C. This temperature was carefully controlled by a gland-cock immediately before entering the still. Having got over this trouble the next point was to control the pressure generated in the still. It must be remembered that the emulsion varied in water content from hour to hour, from 45 to 75 p.ct. If the attendant fired the furnace to give good results when (say) the emulsion contained 45 p.ct. H_2O, the flue gases were sufficiently hot to raise the heat of the feed to the correct temperature. But, unfortunately, when the water content increased, more heat was taken up in the still, leaving the flue gases too cool for preheating the feed. In this way, erratic feed temperature was experienced, resulting in pressure being generated in the first still, and the contents being forced out into the second still. Some hours elapsed before working-levels could be readjusted; and in the meantime there was overheating in No. 1 still, with the result that the safety-valve would "blow." After an hour or two, things would right themselves, and all would go well until "frothing" would commence; and at times, do what we would, this trouble could not be overcome—not even adopting tar-works methods of applying heat inside the dome of the still or running cold water over the still top.

To successfully work-up this emulsion, it is necessary that at least four points be kept under control:

(1) Constant water content of the emulsion.
(2) Regular feed to the still.
(3) Constant temperature of the feed to the still.
(4) Regular firing to give No. 3, and at same time reduce the outgoing tar to below 0·5 p.ct. of water.

No. 1 was obtained by pumping a sufficient quantity of emulsion for a day's working into an overhead tank, and thoroughly mixing. No. 2 was maintained by fixing a number of accurately calibrated jets fed by a constant-level supply-tank, anyone of which could be opened by means of a ½-in. gland-cock; an iron gauze filter being used to keep out bits of coke, wood, waste, or other foreign matter. No. 3. The temperature was regulated by increasing or shortening the length of travel through the waste-gas flue. No. 4 was obtained by observation of a recording thermometer in the flue gas; also noting the temperature of the tar

in No. 2 still, and by making a rough-and-ready test of the run-off tar for water content.

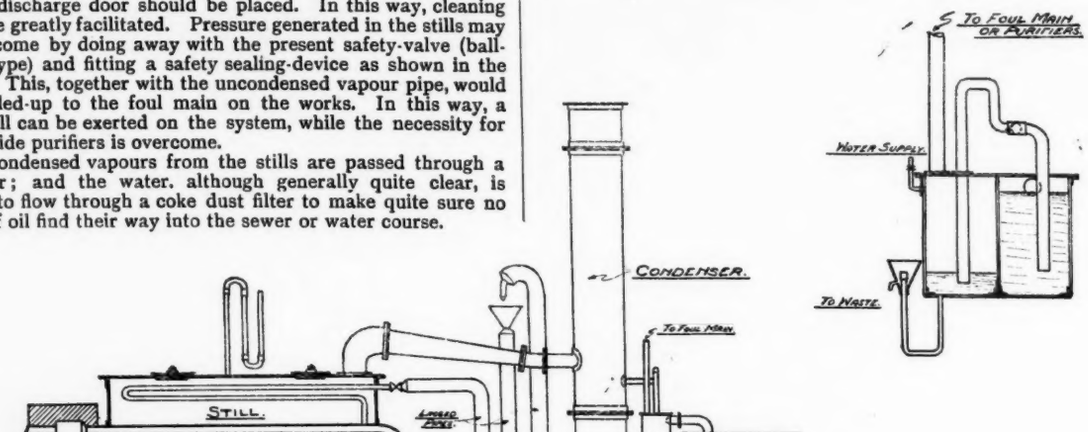
The test is made in the following manner: Two well-polished 5-in. squares of ¼-in. plate glass are used. On to the centre of one plate a spot of the dehydrated tar is allowed to fall from a piece of ¼-in. glass rod. The other plate is then placed over the tar spot and both glasses are pressed together. A film of tar spreading to about 2 in. in diameter results, and small transparent globules will be observed, which can almost be counted in a tar containing up to 1 p.ct. of water.

Inlet and outlet tars are tested daily by the works chemist, together with all sales.

With our plant, we can dehydrate about 15 tons of 50 p.ct. emulsion per twenty-four hours. At the end of each month it is necessary to shut the plant down, and clean out the stills. From 40 to 45 cwt. of dirt, coke, dust, and free carbon are removed. This has to be scraped-up and taken out through the manhole.

In future plants it would be well if the bottom of the still sloped towards one end (away from the fire) or to the centre, where a bottom discharge door should be placed. In this way, cleaning would be greatly facilitated. Pressure generated in the stills may be overcome by doing away with the present safety-valve (ball-weight type) and fitting a safety sealing-device as shown in the sketch. This, together with the uncondensed vapour pipe, would be coupled-up to the foul main on the works. In this way, a slight pull can be exerted on the system, while the necessity for small oxide purifiers is overcome.

The condensed vapours from the stills are passed through a separator; and the water, although generally quite clear, is allowed to flow through a coke dust filter to make quite sure no traces of oil find their way into the sewer or water course.



DEHYDRATING PLANT FOR CARBURETTED WATER-GAS EMULSION.

DISCUSSION.

The President remarked that the paper was a singularly interesting one, and a valuable contribution to the subject.

Mr. E. W. Smith, D.Sc., Chief Chemist at the Birmingham Gas-Works, said they were indebted to Mr. Twine for the enthusiastic way he had dealt with a matter which was particularly interesting to gas-works managements, though it was a subject that had not, on the theoretical side, received much attention. He agreed that free carbon might have something to do with the formation of emulsions; but it was only one of the factors in their formation. In all probability, the whole subject of the colloidal state had, perhaps, the greater bearing on the question. He did not think anyone had shown that, in the absence of free carbon, emulsions could not be formed. The pharmaceutical chemist endeavoured deliberately to make emulsions by bringing together the exact physical conditions; but the object of the gas chemist was the reverse. He was in agreement with all the data Mr. Twine had brought out. There was no doubt that all the phenomena he had noted were correct; but none of them had got down to anything like the explanation of the formation of emulsions of such a nature that they could set about to eliminate or prevent them. So far, everything that had been done in the direction of "curing" emulsions on an economical scale had required distillation in some form or other. There were certain methods which were quite satisfactory; but there were objections which were vital to them. He desired to know whether, in Mr. Twine's opinion, the tars found at Nechells, and on the Mond gas plant at Saltley were those in which the tar was surrounded by water, or tars in which the water was surrounded by tar; for there were two types of emulsion. How were the emulsions formed? How could they be prevented? And how could the water in the tar be separated from the emulsions? There was no doubt that Mr. Twine and Mr. Garratt had made a complete success at the Nechells plant. In 1914, there were two-and-a-half million gallons of water-gas tar emulsion, and to-day the figure was quite negligible. Everything had been done to find out the right conditions for distillation. Two things were fundamental and essential—(1) that the tar, before entering the still, must reach nearly the boiling point of water; (2) that there should be such a condensing area that it could condense whatever water was distilled over. When dealing with tar containing 60 p.ct. of water, the condensing area would be so great that it was not going to be profitable to put in. Consequently, it was decided, instead of working the larger condenser, to connect the outlet with the foul main. By working with a vacuum most of the time, it was found possible to eliminate the trouble of frothing over. If one took a vertical retort tar, and particularly a low-temperature tar, the pitch was rarely higher than 50 per cent. If such tar were to be steam distilled right through to the end, it would be found that there would not be more than from 10 to 20 p.ct. of pitch. This should be borne in mind when determinations of pitch were being made. In laboratory distillations of tar containing water, one heated up the top of the tar before the bottom. They had stills taking two gallons, of cylindrical size with a ring of burners; and the heat was started at the top level and gradually brought down. Thus could be avoided bad bumping and frothing over.

Mr. Milbourne (Messrs. C. & W. Walker, Ltd.) said that about 25 years ago there was a great cry in the gas industry for burning tar. Possibly, with the increased price of coal, it might be heard of again. Many of the blast-furnace people were putting in installations for using tar under the boilers; and if the demands of the miners placed further burdens on the smaller gas undertakings, it might be necessary to consider whether they would not gain greater relief, and make extra profit, by burning tar instead of distilling it. What was the smallest size gas-works that should undertake the distillation of tar? He was interested in two small undertakings which sold tar for road purposes by hydrating it by putting steam coils into a tank. The result was satisfactory. But he doubted if it would pay small works to put in distillation plants for the relatively small amount of tar that had to be dealt with.

Mr. Tooby (Coventry) said his experience was that when the Mond gas absorber was out of action the character of the tar was changed. What was this due to?

Mr. Twine, in reply, said he thought with the absorber out of action the free carbon went forward without tar oils surrounding it. Hence a considerable quantity of water was firmly held, so that no amount of coil-heating would enable the water content to be reduced below from 35 to 40 p.ct.

A hearty vote of thanks was accorded Mr. Twine

RAILWAY LIGHTING AND MAINTENANCE.

Some notes on railway lighting and maintenance were presented at a meeting last Tuesday of the Illuminating Engineering Society, by Mr. A. Cunnington, the Lighting Engineer of the London and South-Western Railway Company. All kinds of lighting were, of course, dealt with in the course of a lengthy paper; but it is only possible here to give some of the points bearing closely upon gas.

The author remarked upon the fact that a good many people appear to overlook the fact that light on a railway is for use, and not for ornament—or, to put it another way, is for working the traffic rather than for attracting custom. Extravagant standards in the near future may have to be resisted by the true lighting engineer as keenly as he pressed for improved standards in the past. The gradual cheapening of illuminants has had a great and beneficent influence in raising standards of illumination. But surely the time will soon come—if it has not already arrived—when we may expect to call a halt in this direction and utilize the increased efficiency in reduction of cost; or, perhaps, one should say, in view of war-time experiences, in avoiding an increase in cost. When very large areas are to be lighted, this question of cost is often a most vital consideration. On the other hand, in considering the expenditure on illumination, the ratio it bears to the total cost of equipment (often small) should be scrutinized, and the needs as regards safety and efficiency of work should not be allowed to suffer.

Maintenance costs are a far more important item in the total

lighting bill than is often imagined. Statistics on one of the trunk railways show that the proportion of cost of maintenance to cost of illuminant was roughly 1 to 4 before the war; and the present-day figures would be nearer 1 to 2. In railway lighting, where burners and fittings are dealt with on a large scale, it is of the greatest importance to adhere as far as possible to a few standard types; and this makes for economy to such an extent that it is often a decisive factor when it is a question of judging between two systems of lighting. Of course, a lighting department will make a point of testing thoroughly any new illuminant or fixture; but the new device will always have a much greater chance of being adopted if it does not run counter to standardization. Fancy methods are often barred, simply because the cost of upkeep would be excessive.

Where incandescent gas lighting is in use, an unmistakable tendency is abroad to standardize a small mantle, generally the "Medium" or No. 2 size; and it may be noted that this allows of ample flexibility in the candle-power of units by the use of one, two, three, or more mantles in each lamp, without having recourse to different types, and consequent possibility of confusion and mistakes. Small mantles are preferable for other reasons, among which may be mentioned their great strength, and the ease with which they can be handled; also the fact that, with diminished pressure or quality of gas, the falling-off of candle-power is not so noticeable—presumably because the small flame fits the mantle more readily than the large.

In specifying platform illumination, a statement, not only of the minimum value, but of the illumination ratio, is essential. The latter is of great importance, because it is the criterion of uniformity, and, judging by experience, a high degree of uniformity is greatly to be desired. It has frequently been proved that, when the illumination provided is fairly uniform, a considerably lower maximum (and therefore average) illumination will suffice, with a corresponding decrease in cost. As regards the height at which illumination measurements should be made, the author of the paper has found that 3 ft. above the ground affords the most useful illumination.

For the large number of important stations with low roofs over the platforms only, there is no doubt an arrangement of frequent small units is desirable. This gives uniformity of illumination, and also allows of the use of reflectors which cut off the direct rays of the lamps at a point well below the horizontal, and thus avoid glare. The absence of glare, coupled with uniformity of lighting, is not only correct lighting, but it makes possible a lower figure of illumination that would otherwise be necessary, and is therefore economically sound. With electric lighting it is comparatively easy to arrange for a considerable number of units of a not very high candle power. Such an arrangement is hardly suitable for gas lighting, as the units must each be more or less weatherproof; and in order to keep down both initial cost and maintenance, it has been found advisable to concentrate the candle power in fewer units. This arrangement has, however, many disadvantages from the illumination point of view; and the author is convinced that there is a wide field for the introduction of a small gas-lamp fitted for a single medium mantle, and provided with a reflector properly designed for close spacing. Such a lamp would have to be wind-proof; but as it would be used under roofing, there would be no need to add to the cost by making it absolutely weather-proof. The system of distant control can be applied to gas, as to other lights; and his Company have installations which have given satisfaction for years. In this case, the lamps are arranged alternately on separate supplies; one being in continuous use, and the other turned out between trains. A special bye-pass service is run to the second group of lamps; and mercury seals are fitted to prevent air getting back into the pipes.

For goods yards, he tentatively threw out the suggestion that the vertical illumination measured in a plane at right angles to the direction of the sidings (and at 3 ft. above the ground) should not be less than 0·01 foot-candle. This would apply to any class of yard, and any part of the yard where shunting is carried out. For the "working areas" a much higher minimum figure would be necessary. He suggested 0·05 foot-candle as a minimum for the working area in single engine yards, and 0·25 foot-candle as a minimum for multiple engine yards. For engine sheds, the minimum illumination should not fall below 0·05 foot-candle—at any rate, not in the neighbourhood of the pits.

Messrs. William Sugg & Co., Ltd., had on view a gas-lamp, in operation, based on a suggestion of the author in the paper. It was explained that it was purely an experimental lamp.

DISCUSSION.

Mr. J. H. HAIGH (Lancashire and Yorkshire Railway), speaking with regard to gas lighting, said that his experience went to show that the small inverted mantle was much more economical all round than the old-fashioned vertical mantle. It could be taken, however, that the vertical mantle gave a better illumination in some respects, especially as regards giving light at longer distances from the lamp, than the inverted mantle; but the upkeep of it, particularly with present-day so-called heat-resisting glass, was very high. The gas-lamp exhibited interested him. The author's mention of duplicate services on a platform for turning out alternate lamps brought to his mind instantly the question of mercury seals, with which he had had a good deal to do about four years ago. Having a station to light, he put in duplicate services on one platform with mercury seals. He did not, as a matter of fact, think much of mercury seals. They did not seem to prevent some air getting back into the mains, because after a lamp had been turned out for a little time there was a more or less explosive mixture in the pipes; and there was the same possibility of damage to the mantles on re-lighting as there would have been without the seals. He had heard the suggestion that there should be a very small opening in the seal, which would allow a tiny leakage of gas. This might be one way out of the difficulty; but he did not think he should like to let gas escape to keep his mercury seals in action.

Mr. F. W. GOODENOUGH (Gas Light and Coke Company) said he would like to remark upon the question of the ratio of maximum to minimum lighting. A great deal too much importance could be attached to this, provided the minimum was sufficiently high. The whole point was to have no badly lighted patches. If every part was fully lighted, it did not matter nearly so much if the maximum was a considerable ratio higher than the minimum. If they had a well-lighted platform or street, there might be a ratio of 10 to 1; but the eye did not observe it in the least. In pre-war days, when Whitehall was, in his opinion, one of the best-lighted streets in Europe, it was possible to motor down the thoroughfare at 25 miles an hour, and see the whole length of the roadway clearly in front, without any observation by the eye that there was any difference in the maximum and the minimum illumination, which, however, had a ratio of something like 12 to 1. It was if there was a badly-lighted patch that the trouble arose. He was rather surprised at Mr. Cunnington putting a damper on any railway company spending too much money on railway illumination. From his own observation, he did not think they were anywhere near the point of extravagant lighting at railway stations in London, even at the best-lighted terminal stations. He personally still thought that an improvement could be effected in the lighting of the approaches to many of the terminal stations. There were not many railway stations where the lighting at night was sufficient to enable one to move about as rapidly as could be done in the daytime. This, in his opinion, was the criterion which should be applied. With regard to mercury seals, the Gas Light and Coke Company had had something like ten years' experience of these at Victoria Station, in the lighting of a series of alternate lamps, and there had never been any difficulty at all in the operation of the seals. In his opinion, they had not reached a sufficiently high level of illumination on railways to be able to say that they had got to a point where they should not spend more money.

Mr. CUNNINGTON, replying to the discussion, said he did not see why the small gas-lamp which he had suggested should be unsatisfactory. If the lamps were spaced at 24 ft., with one mantle fitted in each, it would be the same as spacing them at 48 ft. with two mantles in each lantern. This would give the same number of mantles per run of platform, with a better illumination; and if the smaller lamp could be made for less than half the cost of the larger one, there would be a very considerable gain. Mr. Goodenough had replied to Mr. Haigh's point as to the mercury seals. He had not found any trouble with them himself either. Apparently Mr. Haigh had been unfortunate. He agreed that the question of maintenance was one of the most important things to be considered. Gas companies knew this well enough; and the railway companies were finding it out. Mr. Goodenough had suggested that if the minimum was all right, it did not matter about the illumination ratio—but surely it did, because if the minimum was all right, they did not want to go above the minimum. If the maximum was twenty times the minimum, that was obviously a waste.

Estimated Capital in Oil.

The "Financing of Oil Fields" formed the subject of a paper read last month by Mr. Montagu Summers before the Institution of Petroleum Technologists; and in it the author said there is nothing gained by trying to hide the fact that oil-finding in its early stages must always be a speculative business. A great boon to the oil industry in the country to-day is the establishment of proper schools of training for oil-experts, who have been much wanted. Of course, as was pointed out in the paper, public interest in the petroleum oil industry is quite young so far as this country is concerned; concentrated attention on the oil business having extended over not more than the past fifteen years. The amount of capital invested in oil enterprise, however, during this period has been, said the author, very large—probably of greater proportions than in any other industry outside the maintenance of railways. He estimates the amount of authorized capital in limited liability companies to have been about £190,000,000; and of this there has been issued some £125,000,000, He puts the total loss to the British public, owing to indifferent and improper finance, bad management of properties, and other causes, at £15,000,000 in round figures. Truly, as he says, this figure may appear somewhat large, as representing a loss to the public; but perhaps the luckless investors will derive consolation from the assurance that it is not nearly so large an amount as that lost by the public in the exploiting of several other minerals. Then, again, he remarks, the general public have come by far more than this amount through the successful ventures that have been run with adequate financial facilities, and have been properly managed under expert advice. In American oil companies, the capital invested is more than £380,000,000; making the total sum invested in petroleum companies £505,000,000. No account is taken, in arriving at this position, of the many other industries allied to that of oil production. In 1917, the world's production of oil was 503,708,000 barrels.

Summer Time.—It has been officially intimated that summer time will be brought into force this year on the morning of Sunday, March 30, and will continue until the night of Sunday-Monday, Sept. 28-29. Last year, summer time began March 24.

REGISTER OF PATENTS.

Portable Gas-Ovens.—No. 118,836.

Société du Gaz de Paris.

No. 9123; June 3, 1918. Convention date, Sept. 5, 1917

The patentees claim as their invention: A portable gas-heated oven for domestic use formed with a double casing at the top, bottom, sides, and back, and having openings in certain of the plates forming the casing arranged in such a manner as to ensure circulation of hot gases from the inside of the double bottom by the side chambers into the top chamber; thence to the inside of the oven; and finally into the back chamber of the casing—the gases escaping into the atmosphere by openings from the back chamber.

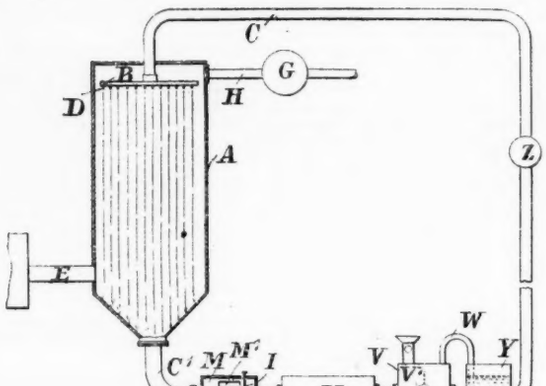
Extracting Ammonia from Gases and Vapours and Producing Nitrogen Compounds.—No. 121,754.

Pease, E. L., of Darlington.

No. 13,560; June 22, 1917. No. 13,608; Sept. 21, 1917.

This invention has reference to the treatment of gases and vapours containing ammonia for the extraction of ammonia therefrom.

For this purpose, the gas is brought into intimate contact with a finely-divided solution of a salt—such as calcium chloride or zinc chloride—that possesses the property of forming a double compound with the ammonia present in the gas, and, in turn, of readily giving it up under proper treatment. The solution is delivered as a shower by distributing devices provided with spraying nozzles, and thus caused to fall in a finely-divided condition through a vessel in which the gas rises, and thus comes into "intimate and effective" contact with the solution.



Pease's Ammonia Extractor.

The extraction of the ammonia from the gas can be conveniently carried out in a vessel A, in the form of a tower, provided at its upper end with a liquid distributing box B connected to a pipe C, through which the solution of calcium chloride is supplied, and with a number of spraying nozzles D, whereby the solution of calcium chloride is caused to fall through the vessel in the form of fine spray. At its lower end, the vessel is provided with an inlet connected to a pipe E through which the gas (containing ammonia) enters and is drawn upward through the vessel by an exhausting device G, connected to an outlet pipe H, so as to be brought into contact with the spray of calcium chloride, which absorbs heat from the gas in addition to the ammonia therein. The cooled gas leaves the vessel through H; while the heated liquid, with absorbed ammonia, leaves the vessel through an outlet pipe C^1 at the bottom.

At the same time, the calcium chloride solution eliminates from the gas any solid particles of matter which float on the surface, and can be removed by a scraper or filter at I, consisting of a vertical plate depending into the solution in a box M, provided with a lateral opening through which the matter can be removed as desired.

When the gas contains carbon dioxide, this gas, by reaction with some of the calcium chloride used and the ammonia, forms calcium carbonate, which deposits in a settling vessel U external to the gas treatment vessel A.

When the gas also contains tar in suspension (in addition to carbon dioxide and ammonia), it is advantageous to treat it with the solution of calcium chloride while it is at a high temperature, and before the whole of the tar has been separated from it. As a consequence, a portion of the tar will be washed-out of the gas by the solution, and will mingle with the calcium carbonate being simultaneously formed, and constitute with it a mixture that will not readily set and which, being lighter than the solution, is easily removed from it (as in the separating box M), dried, and readily burnt for the recovery of the lime; while the greater proportion of the tar passes onward with the treated gas. The remainder of the tar passes off with the treated gas, to this extent retaining the calorific value of the gas, if the gas is to be directly burnt for the production of heat; or the remaining tar can be separated from the treated gas by (for example) a gas scrubber or washer, if the gas is to be purified before use—as for an internal combustion engine.

When using the solution of calcium chloride for treating gas at a high temperature, the solution, upon leaving the absorption vessel A, will be at a high temperature, and by at once adding milk of lime to it in a suitable vessel—for instance, V, provided with means for boiling the mixture, and it may be with a mixing or stirring device V^1—ammonia will be evolved; and this, when led off by a pipe W and condensed in water in a separate vessel Y, will form ammonia liquor. This liquor will be pure, owing to the selective action of the calcium chloride, which will have absorbed only ammonia from the gas. The heated solution, after being filtered, is returned by a pump Z for reuse in the vessel A.

When gas at a high temperature is obtained from a source wherein it is liable to be contaminated with tar—for instance, gas obtained from coal carburization plant, as in gas-works—and such gas is subjected to a preliminary washing or scrubbing to cool it to the suitable temperature described, to admit of the ammonia being abstracted from it, the washing or scrubbing may be carried out to such a degree as also to remove the whole of the tar from the gas, and thus avoid contamination of the solution of the double compound of chloride of calcium and ammonia with tar.

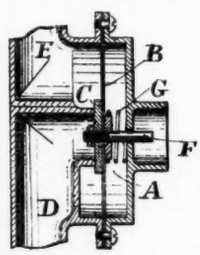
Automatically Closing a Gas Supply.—No. 122,283.

Kennedy-M'Gregor, J. A., and Hodgkinson, E. H., of Birmingham.

No. 1924; Feb. 2, 1918.

This invention relates to a device for automatically closing a gas supply or conduit upon a reduction of pressure of the supply, and which remains closed upon the pressure being again increased. It is of the type involving a valve adapted to be alternately under the influence, in opposition to a suitable resistance, of two different pressures exerted by the gas upon different areas of a diaphragm by which the valve is carried, and in which a spring is incorporated to act upon the valve in opposition to the pressures exerted by the gas.

Previously in this type of apparatus the diaphragm has been rigidly fitted with a projection by means of which it, or the valve, can be displaced; the displacement being effected through the medium of a lever. According to the present invention, in this type of apparatus the valve is fitted with a projection adapted to pass through an opening in the casing containing the diaphragm, so as to be manually operatable directly from the exterior of the latter.



Kennedy-M'Gregor and Hodgkinson's Automatic Gas Supply Regulator.

The circular enclosed chamber A is divided by a flexible diaphragm B, which centrally carries a valve C. On one side of the diaphragm the gas supply conduit D passes through the wall of the chamber and, being provided with a right-angle bend, it terminates in such a position that its open extremity can be closed by the face of the valve. Another gas-conduit E passes out of the chamber on this same side of the flexible diaphragm; while on the other side of the diaphragm the valve is furnished with a rod F, that passes through the casing. Around this stem or rod, and between the casing and the plug, a light coiled spring G is provided. When the stem F is pulled by hand, the valve is removed from the extremity of the delivery conduit D against the resistance of the spring, and gas commences to issue and fills the space on the one side of the diaphragm, so that its whole surface is subject to a pressure which is sufficient to overcome the pressure of the spring and allow the gas to continue to pass from the admission pipe D to the other conduit E, by which it is conveyed to the apparatus at which it is utilized. Should the supply fail, the gas pressure on one side of the diaphragm diminishes until the effort of the spring is sufficient to close the valve. Upon the gas being then supplied, the surface upon which the pressure occurs at the face of the valve C is so small that the pressure is insufficient to compress the spring; but when the supply is desired, it is only necessary to pull out the rod F against the resistance of the spring.

Low-Temperature Distillation of Coal.—No. 122,496.

Hiller, H. K., of Victoria Street, S.W.

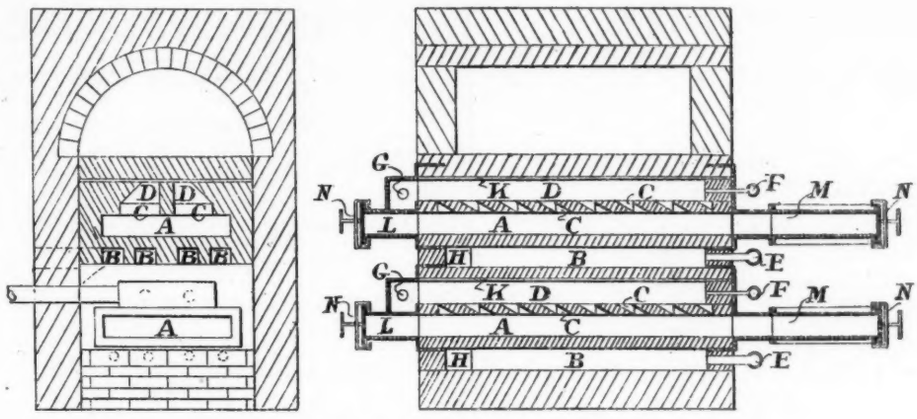
No. 1746; Jan. 30, 1918.

This invention relates to apparatus for the low-temperature distillation of coal, cannel, and other bituminous substances for the production of oils, and of gas of high calorific power suitable for motor engines—especially the application of the principles embodied in the inventor's patent No. 118,522, dated Nov. 20, 1917.

It has already been established, he says, that to obtain the best results from the low-temperature distillation of such bituminous substances, it is necessary (owing to their poor heat conductivity) that they should be distilled in thin layers—that is, in layers not more than 5 in. thick—as otherwise the walls of the distilling vessel must be heated to such a degree that the distilled vapours are subjected to destructive temperatures, which decrease their commercial value. It is also known that the best distillation result is obtained when the substance undergoing distillation is progressively heated.

The coal is distilled in a horizontal retort 5 in. deep, about 30 in. wide, and from 6 to 20 ft. long—depending on the quantity of material to be distilled. This retort can be constructed of cast iron or fire-brick, or a combination of these or other heat-resisting substance. The cross sectional body of the retort is not entirely continuous—being broken on the upper part for about two-thirds of its width. In this broken portion are inserted cast iron or fire-brick louvres, set at an angle of 30° to the centre line of the retort, or the material of the retort is itself pierced with openings through which the gases and vapours pass into conduits immediately above the louvres or openings. The bottom edge of the louvres forms approximately two-thirds of the roof of the retort, and by the large number of openings thus provided in the length of the retort, the gases and vapours are immediately removed from contact with the heated coal or retort surfaces.

The coal is scoop-charged into the retort by a power-driven machine. To obviate as far as possible any intrusion of a new charge of coal into the louvres under the action of the ram when charging, a thin steel shield (the full width of the retort and slightly longer than the stroke



King Hilier's Low-Temperature Coal Distillation Plant.

of the charging ram) is inserted over the preceding charge, and in advance of the scoop carrying the new charge of coal. The shield also prevents any dust from the fresh charge of coal rising through the louvres and being carried in the stream of gas and vapours to the condensers.

The heating of the retorts is effected from the underside only by gas-burners—in the retort now being described to the number of four. Each burner functions in a separate flue about 5 in. square. The burners are fixed under one end of the retort; but the flues pass under the full length of it—being connected at the opposite end, and the products of combustion conducted to a main flue regulated as required by dampers.

The gases and vapours passing through the louvres into the gas-conduits are cooled, absorbed, and swept out by streams of compressed gas directed into the conduits above the exit end of the retort, in accordance with the patent of 1917.

Thus each distillation unit consists of four sections—namely, the heating flues underneath the retort; the coal containing chamber, or retort proper; the louvres, separating the coal from the gas-chambers; and the gas-chambers themselves. These units are superimposed one over the other to any suitable number within a brick arch, with a layer of non-conducting material placed between each unit, to divide the gas and heating chambers from each other.

The coal is introduced into the retort at the end furthest away from the burners through a cast-iron mouthpiece, provided with a gas-tight door. The mouthpiece is common to the coal and gas conduits of the setting—the latter discharging into a separate compartment in the upper portion of the mouthpiece, from which the gases and vapours are removed through pipes by exhausters regulated to maintain the chambers at level gauge.

Each charge is a proportional part (say, one-third) of the total capacity of the retort, and is allowed to rest in its one-third portion of the retort for any predetermined time. It thus follows that the charge which is directly over the heating burners attains the highest temperature, while the charges introduced later are in cooler zones—"thus attaining the desired progressive heating."

The coal having been deprived of its volatile matter is passed out of the retort by the power machine into an extended cast-iron mouthpiece of the same section as the retort, and of the same proportional length as each individual charge. Between the end flanges of the extended mouthpiece there are cast fins to give increased radiation effect, so that during the period in which the hot coke rests in it, the coke is cooled to such a temperature that, when finally discharged into the atmosphere, it is no longer liable to take fire. When the apparatus is in regular work, the charging end of the retort is always sealed by being filled with fresh coal, while the discharging end is always sealed by a length of coke equal to the length of the individual charge inserted in the retort. In this way, the entrance of atmospheric air into the gas-conduits is practically impossible.

The illustration represents two units of the apparatus—a front and cross sectional elevation, and a longitudinal sectional elevation.

The brickwork chamber shown contains the assembled units of retorts. A B are the combustion and heating passages; C, the vents from the retort; D, the gas collecting chamber; E, the supply pipes for the heating gas; F, the pipes conveying high pressure gas for cooling and absorbing the freshly evolved vapours and sweeping them out of the collecting chamber; G, the outlet pipe to the exhaust fan condensers, &c.; H, the flue openings for the combusted gases; K, the non-conducting layer between the units; L, the charging end mouthpiece; M, the extended discharge mouthpiece; and N, the mouthpiece doors and fasteners.

Gas-Engines.—No. 122,338.

CADY, J. W., of Toronto, Canada.

No. 6454; April 16, 1918.

The object of this invention is to utilize all heat usually wasted in ordinary operations due to excessive radiation throughout the working stroke, water-cooling or forced-air heat waste, and a high temperature exhaust of the engine. Moreover, the power of the engine is rendered variable by the provision of means for varying the pressure of air and gas to form the explosive charge, and of air for subsequently augmenting the pressure. Further, not only can the power of the engine be varied while using any one kind of gas, but means are provided whereby any kind of gaseous fuel may be used in the same engine.

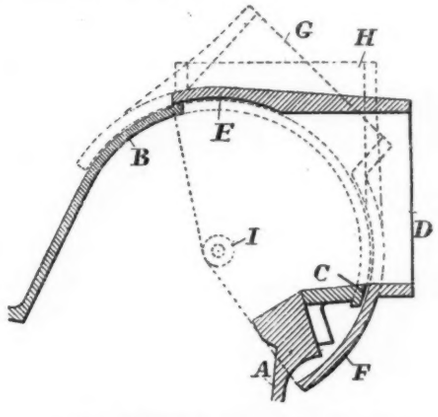
The patentee claims as his invention: In a two-cycle gas-engine, a piston cylinder and an explosion chamber; an absorbing chamber between the explosion chamber and the piston cylinder; means for moderating the temperature of the atmospheric air while in transit to the compressors, and compressing two unequal volumes of air to different predetermined pressures; valve operative means for independently and successively supplying gas and then air to the explosion chamber at two unequal pressures, while concurrently supplying air to the absorbing chamber at a pressure much less than the calculated pressure of the exploded charge, while completely scavenging the piston cylinder; means for separately isolating both chambers and the piston cylinder from one another while igniting the gas and air mixture in the explosion chamber, for then admitting the ignited charge to the air-charged absorbing chamber, and then feeding the combined air and combustion products to the piston cylinder.

Gas-Fires.—No. 122,550.

YATES, H. JAMES, and HEGGIE, C., of Aston, Birmingham.

No. 5091; March 22, 1918.

This invention has for its object to provide a swivel outlet flue of improved construction for gas-fires.



Yates and Heggie's Gas-Fire Outlet Flue.

The burnt gas outlet at the rear of the frame A of the fire is formed along its upper side with a curved portion B, and provided along its lower side with a narrow edge C, which coincides with an imaginary cylindrical surface drawn as a continuation of the outer surface of the curved portion. The lower lip of the outlet on which the edge is formed is preferably made separate from A and adjustable thereon. On this outlet is pivoted a flue connecting piece D, formed along opposite sides with a pair of curved portions E F, also coinciding with the cylindrical surface. The portion E co-acts with the upper outer surface of the outlet; while the other F co-acts with the outer edge C of the lower portion. The disposition of the curved portions on the connecting piece is such that the piece can be adjusted from a position in which its outlet is horizontal (as shown in full lines) to one in which its outlet is inclined at about 45°, as indicated by the dotted lines G. To adjust the inclination from the latter to the vertical position (indicated by the dotted lines H), the connecting piece is first detached and then replaced with its curved portions in a reverse position to the original. Pivot screws I, at the ends of the connecting piece, are employed for securing it to the outlet. An unimpeded passage is thus obtained throughout the whole range of adjustment.

Regenerative Gas-Fired Furnaces.—Nos. 122,673 and 122,674.

DAVIS, H. N., and TWIGG, W. R., of Luton.

Nos. 19,189-90; Dec. 28, 1917.

These two specifications relate to means for controlling the reversibility of a regenerative gas-fired furnace; the desired object being effected by simultaneously controlling the admission of gas and/or

primary air and/or secondary air to the furnace and, if so desired, the exhaust of the waste gases from the furnace.

These are two lengthy specifications, accompanied by eight sheets of lettered drawings. The illustrated article appearing last week, pp. 385-7—describing "The Davis 'Revergen' Principle of Firing Furnaces with Town's Gas"—gives, however, such a clear account of what is aimed at by the patentees that no further details are needful for the moment.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Feb. 19.]

Nos. 3179—3808.

Aldred, A. E.—"Globes for gas-fittings." No. 3510.
Anninger, M.—"Gas, &c., meters." No. 3611.
Arnold, J. E.—"Devices for indicating position of gas-fittings, &c." No. 3753.
Bain, D. B.—"Gas-cleaning device." No. 3405.
Brooke, H. L.—"Gas and vapour pumps for internal-combustion engines." No. 3203.
Brown, J.—"Holders for gas shades or reflectors." No. 3212.
Buckingham, E. J.—"Rigid coal-gas containers for compressed gas for motor vehicles." No. 3646.
Buckingham, E. J.—"Coal-gas carburettor for motor-cars, &c." No. 3647.
Cheshire, W. D.—"Proportional gas-meters." No. 3636.
Crank, M. A.—"Gas-generators." No. 3358.
Fornas, L.—"Gas-producers." Nos. 3431, 3503.
Gibbs, A.—"Bunsen burners." No. 3208.
Hunt, N. H.—"Fluid-meters." No. 3453.
Hutton, J.—"Controlling or operating means for bunsen burners, &c." No. 3182.
Keith, J.—See Bain. No. 3405.
Kent, W. G.—See Hunt. No. 3453.
Park, T. H.—See Aldred. No. 3510.
Parkinson and W. & B. Cowan.—"Proportional gas-meters." No. 3636.
Stokes, J. W. B.—"Coal-gas producing plant for motor vehicles." No. 3633.
Svensson, E.—See Crank. No. 3358.
Telephos Domestic and Street Lighting Company.—"Operating electric switches from a distance." No. 3789.
Thomas, J. G.—"Incandescent gas burners or mantles." No. 3563.
Townsend, W. W.—"Apparatus for heating water gas in coal carbonization." No. 3191.
Waldie, C. J.—See Stokes. No. 3633.
Weippert, D.—See Parkinson. No. 3636.

[Extracted from the "Official List" for Feb. 26.]

Nos. 3809—4499.

Acetylene Equipment Company.—"Gas-pressure regulators or reducing-valves." No. 4486.
Anderson, A. E.—"Pyrophoric devices for igniting gases." No. 4290.
Anninger, M.—"Slot gas-meters." No. 4274.
Berry, H. H.—"Electric and gas ovens, stoves, &c." No. 3883.
Bolton, F.—"Welded and brazed pipe joints." No. 3989.
Coxon, G. H.—"Distillation of hydrocarbons." No. 4266.
Cushion, J. D.—See Anderson. No. 4290.
Davies, W. E.—"Carbonization and gasification, plant, &c." No. 4339.
Davies, W. E.—"Separation of gases." No. 4428.
Elsy, A. E.—"Gas-stoves for heating irons." No. 4261.
Freeman, N. H.—"Gasifying solid and liquid fuels." No. 4154.
Helps, G.—"Bunsen burners." No. 4167.
Jackson, Ltd., J.—"Valves or cocks." No. 3850.
Mathy, M.—"Circular burners." No. 4414.
Mattock, W. G. H.—"Gas burners." No. 4008.
Pearson & Son, S.—See Coxon. No. 4266.
Särnmark, A. U.—"Safety cut-off devices for extinguished gas-burners, &c." No. 3926.
Sheringham, G. H.—"Artificial illumination." No. 4006.
Smith, C. H.—"Gasification of coal and obtaining bye-products therefrom." No. 3916.
Smith, C. H.—"Retort mechanism." No. 3917.
Smith, C. H.—"Furnace retorts." No. 3918.
Stephenson, G. B.—See Acetylene Company. No. 4486.
Sugg & Co., W.—See Mattock. No. 4008.
West, J.—"Gas-producers." No. 4010.
Wild, W.—See West. No. 4010.
Wildbore, J. E.—"Anti-vibrating devices for incandescent gas-lights." No. 4451.
Willner, S.—"Incandescent gas-lights." No. 4403.

Cost of Coal and Gas at Barnstaple.—The accounts submitted to the annual meeting of the Barnstaple Gas Company showed a balance to the credit of the revenue account of £2469; and dividends of 7½ p.ct. on the "A" shares and 5¼ p.ct. on the "B" shares were approved. Mr. F. W. Hunt, the Vice-Chairman, who presided, said that, considering the many difficulties and the enormous increase in working costs the accounts were quite satisfactory. The total income was £13,881, and the expenditure £12,010; and the profit of £1871 compared with £1720 in 1917. In 1913, the cost of coal was £4580, and in 1918 it was £7785; and wages and coal together cost £3708 more than in 1913. Since 1915 the price of gas had been increased by 35 p.ct., whereas coal had advanced by 85 p.ct. The relief afforded to shareholders under the Act passed last session was a poor return for the services gas companies had rendered to the country. The sales of gas had increased about 2 p.ct. over the previous year.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Gas Investigation Committee.

Sir,—With reference to Mr. J. H. Fairweather's second letter, appearing in yours of the 25th inst., I should like to thank him for the point he raises in connection with the specific gravity of a semi-carburetted water gas given in the report as ·538. The typed draft consulted also gave ·538; but reference to the original records shows that it was copied wrongly, and should have been ·654.

Mr. Fairweather's other remarks have been noted. The suggested method for determining primary air had been tried substantially as described, but has not yet been found satisfactory, mainly on account of the delicately-balanced pressures required.

John W. Cobb,
Secretary, Gas Research Sub-Committee.

The University, Leeds, Feb. 28, 1919.

Eight Hours' Day.

Sir,—The question of an eight hours' day being much in evidence at the present time, and attempts having been made in certain quarters to have the principle applied to gas undertakings as well as to other forms of industry, I should be glad if any of your readers could enlighten me as to the method in which such a scheme could be established in connection with small works (say) of under 30 million c.ft., of which there is a preponderance among the gas undertakings in this country.

Even in present circumstances, the financial aspect of very small works—*i.e.*, up to one million c.ft. per annum—will not allow of the employment of more than one workman. The daily amount of labour required to carry on all the necessary operations is barely sufficient to make up a good day's work for one man, though it must necessarily involve both day and night duty—short stretches of work with long rests in between. How, then, is it possible to arrange for the introduction of an eight hours' day, and the employment of three men?

On a 10-million works, the staff for the greater part of the year consists of a day stoker and a night stoker, with an unskilled labourer to carry out the yard duties and odd work generally. This gives an average daily make of about 12,000 c.ft. per stoker, as compared with 30,000 c.ft. or more on a medium-sized works. To employ three stokers, in order to bring about an eight hours' day, would reduce the make to 8000 c.ft. per man; and the necessary increase in the price of gas to cover such an eventuality would meet with strenuous opposition from the majority of the consumers. A reasonably-minded workman would, I imagine, also feel that under such conditions he had not really carried out an honest day's work.

Perhaps some of your readers can suggest a way out of the difficulty. If so, other country managers, in common with myself, would be greatly obliged by the expression of their opinion.

Perplexed.

March 1, 1919.

The Dangerous Governor-House.

Sir,—There has been another accident, and most lamentable loss of life, attributable to covered governors—this time at the Nechells gas-works of the Birmingham Corporation. Why should the governor be housed? Some years ago I found Mr. J. Gaunt, the Engineer of the Aberystwyth works, in trouble about an escape from the governor connections, and advised him to remove it into the open, which he did; and there it has worked with complete satisfaction ever since.

In many cases it would, of course, be simpler to remove the house, than the apparatus.

Henry Woodall.

Llandudno, Feb. 27, 1919.

Temperature Rise in an Oxide Purifier.

Sir,—Many of us were very much interested in Mr. G. Weyman's article, on "Oxide of Iron Purification," in your issue of Feb. 18. We have had, and are as a matter of fact at the present time having, considerable trouble with a purifier rising very rapidly in temperature, in exactly the same way as described in Mr. Weyman's second paragraph.

It would be useful if Mr. Weyman, or anyone else who has had the same experience (I suppose it is common—at any rate, it is so here), could tell us what steps to take to get such a purifier into a normal condition for work.

In our case, the temperature rise is equally rapid, whether clean or foul gas is admitted.

J. R. Bradshaw, Engineer and Manager.

Retford Corporation Gas-Works, Feb. 24, 1919.

National System of Decimal Coinage.

Sir,—Will you permit me to draw attention to a slight error on the part of your compositors? On p. 388 of the issue of the "Journal" containing my article on this subject the total mal value should be shown as 8·10, and not £8 10s. as set up.

G. W. Limmer.

Bournemouth Gas and Water Company, Feb. 27, 1919.

Southend Corporation and the Leigh Gas-Works.—The Southend Corporation Finance Committee report that the Leigh-on-Sea gas undertaking has provided £3413 in relief of rates since it was transferred to the Corporation in 1913. If any loss is incurred on the undertaking during the present financial year, it will probably be trifling in amount, and have no appreciable effect upon the rates.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The further Standing Orders applicable to the following Bills have been complied with: Hartlepool Gas and Water Bill, Newark Gas Bill, Pembroke Gas Bill, Sheringham Gas and Water Bill, Stourport Gas Bill, Sunderland Gas Bill.

Bills read a second time, and committed: Huddersfield Corporation Gas Bill, Stockton-on-Tees Corporation Bill.

The following Bills were read a second time, and committed: Hartlepool Gas and Water Bill, Newark Gas Bill, Pembroke Gas Bill, Stourport Gas Bill, Sunderland Gas Bill, Brentford Gas Bill.

HOUSE OF COMMONS.

Progress of Bills.

In the case of the Northampton Gas Bill, the Standing Orders not previously inquired into, which are applicable thereto, have been complied with; and the Bill has been committed.

The Coal Industry Commission Bill.

The full text has been published of the Coal Industry Commission Bill, which is backed by the Prime Minister, Mr. Bonar Law, and the Attorney-General. It provides for the appointment of Commissioners, including a chairman who shall be a Judge of the Supreme Court, for the purpose of inquiring into the position of, and conditions prevailing in, the coal industry, regarding (among other matters) wages and hours of work, cost of production and distribution of coal, selling prices and profits in the industry, and "any scheme that may be submitted to, or formulated by, the Commissioners for the future organization of the coal industry, whether on the present basis or on the basis of joint control, nationalization, or any other basis." Any report of the Commissioners, and any minority report, shall be laid as soon as may be before both Houses of Parliament; and the Commissioners may make interim reports, and shall, as soon as practicable, make an interim report on the questions of the wages and hours of work of the colliery workers. The Commissioners may publish, from time to time, information obtained or conclusions arrived at by them.

The Bill has since been passed by both Houses.

London Gas-Works and Coal Control.

Sir J. Walton, in the course of the debate, on the 24th ult., on the introduction of the Bill to constitute a Coal Industry Commission, said that, to show the effect of what had been done by Governmental control and rises in wages so far, he would instance the case of London gas-works. He had returns from two great London Gas Companies, from which he found that they bought in 1913 gas coal at 11s. 8d. per ton, and they were paying now 22s. 9d. The cost of freight from Newcastle to London at the beginning of 1914 was 3s. per ton, and to-day it was from 15s. to 17s. per ton, with the difference also that the shipowner did not bear the cost of unloading. There were millions of tons sent to London for gas-making purposes; and whereas coal cost 14s 8d. c.i.f. in London before the war, it now cost 39s. 9d. per ton. The effect of this on the inhabitants of London was that the price of gas in the case of one Company had been raised from 2s. 6d. to 4s. 4d. per 1000 c.ft., and in the case of another big Company from 2s. 2d. to 4s. 4d. He thought that the effect of further rises in the price of coal, as affecting gas-works like those in London, and on the whole community, must be included and taken into consideration in any inquiry that might be held.

A Gas Company's Land and Allotments.

Major Prescott asked the Parliamentary Secretary to the Board of Agriculture if he was aware that the Tottenham Urban District Council claimed that a notice was served upon the local Gas Company on Nov. 13, 1917, taking over the Willoughby Farm site under the Cultivation of Lands Order; and whether, if he was not able to agree with the contention of the Urban Authority that such notice was valid, he would consider the propriety of taking effective action with a view to the allotment cultivators remaining in possession of their plots until the Gas Company produced satisfactory evidence that the land was required for a greater public need than the production of home-grown food.

Sir A. Boscawen (Parliamentary Secretary to the Board of Agriculture), who replied, said that the agreement between the Urban District Council and the Company superseded the entry by the Council under the Cultivation of Lands Order; and consequently the notice to quit under the agreement was valid. The Board were, however, in communication with the Company; and they had every hope that the Company would agree to a continuance of the tenancy so far as the greater part of the land was concerned.

Summer Time.

Mr. Shortt (Secretary of State to the Home Department), in reply to questions by members, announced that "Summer Time" would be brought into force this year on the morning of Sunday, March 30, and would continue until the night of Sunday-Monday, Sept. 28-29. March 30 had been fixed after consultation with the Coal Controller and other Departments interested. To fix March 1, as in France, would have inflicted great inconvenience on those who began work early, without any compensating advantage. With a view to a large saving in electricity and coal, the question of putting the clock back another hour from the beginning of June to the middle of July would be considered.

MISCELLANEOUS NEWS.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. H. E. Jones in the chair.

The Secretary (Mr. Chas. W. Braine) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The War and Ship Losses.

The Chairman, in moving the adoption of the report and accounts, said they met for the first time after the conclusion of the war; and to a certain extent their minds had been relieved. The anxieties of the Directors and of the officials and other of their employees had been much mitigated by the fact that there were no longer submarines seeking to sink their ships, their men, and their coals. A very large number of losses had been incurred in this way; and they had reason to remember the war by the fact that it was responsible for taking away one of the most serviceable and valuable ships for economizing the cost of their coal transport. This was the little ship "Wandle," which had a successful encounter with a submarine early in the war. The loss was occasioned by having to navigate at night, when there were no coast lights; and, getting near the beach, the ship was wrecked. They also lost the "Lightfoot," which was taken from them by the Government; and she had hardly got 200 miles from the Thames where they took her over, before she was submarined. The Directors had now to make other provision. Although the war was over, the prices for all these sort of things were very exalted; and they had to pay very dearly for anything of the kind. He laid stress on this, because he was going to refer to it in connection with the expenditure on capital in other directions.

Men who fought for their country.

While speaking of the war, he might say that 718 of their men, or about 60 p.ct., joined the forces. Sixty of them had been lost. Their bones rested in the soil of France; they yielded up their lives for their country, as none could do better. Incidentally, he would add that, while 129 had returned to duty, there were still a large number for whom they were waiting; and, of course, they meant to keep their positions open for them until they did return. The Directors also took care that they lost nothing of the advances that they might have had, if they had not surrendered everything by giving their services to the country. Of those who had been serving, a great many had received considerable distinctions. There was a clerk named Carter who not only received the Croix de Guerre from the French war authorities, but also the Military Medal from our own, as well as a commission. There was Sergeant-Major Loder, a driver of a transport vehicle, who received the Distinguished Conduct Medal for conspicuous bravery in rescuing men and materials from a munitions camp which was on fire. It was a matter of great bravery to go into the midst of explosives already on fire. He was recommended by the General Officer commanding in the district for a commission; and Wandsworth. There was another driver, Gunner F. Batt, who also showed great bravery in maintaining telephonic communications. He is also now back with us. He received the D.C.M. A clerk in the district office received the Croix de Guerre; and ten others had received the Military Medal. He thought that, when they put up a roll of honour to their departed, it might have some reference upon it to the distinctions which their comrades had won. This would have the approbation of the proprietors. [Hear, hear.]

The consumption and the price.

With regard to the accounts for the half year, he might say at once that any comparisons such as he had previously indulged in, to show progress or falling-off as the case might be, would be quite fruitless to-day, so great were the convulsions—almost earthquakes—and alterations in the costs of labour and materials. It would be quite idle to attempt anything of the kind, until they resumed normal conditions. He must therefore ask the proprietors to accept his assurance that, with regard to the products from the materials they received (which were bad enough through contamination with dross), the results obtained showed that the management and the plant had all been working to the best advantage under the circumstances. But there were certain things which he would deal with as being of vital and general interest. The sale of gas in the half year resulted in a falling-off of 9 p.ct. which, as the report told them, was chiefly due to the interference of the Household Fuel and Lighting Order. In this connection, as this was the first meeting over which he had presided since the sad event, he must express deep regret that the Coal Controller had passed away through illness caused by influenza succeeded by pneumonia. He personally had had several interviews—very urgent interviews—with Sir Guy Calthrop. On his own side, these were very discouraging interviews; on Sir Guy's side, they were the same, because he had not much comfort to offer. He (the Chairman) came to the conclusion that the Coal Controller was a man of great strength of character, a most able man, and one who could command the confidence of those who employed him, as well as those who came under his ban—the consumers of coal for any purpose. It was regretted that they had lost his services; but he hoped that there might be success in calming the present coal crisis, and that they might return to more normal ways, and have no further use for the regulations which had had the effect so far of frightening and interfering with the habits of the best class of consumers on the district to such an extent that their average consumption of gas was diminished by as much as 50 p.ct. The consumption of the second class of consumers was diminished by 15 p.ct. But he was glad to tell the proprietors that the third class—the coin-meter consumers—succeeded in burning 2 p.ct. in excess of what they had done before, in spite of all control or regulation. It was pretty obvious from this that, while a few men

could be frightened by threats of imprisonment and fines, when it came to threatening 30,000 or 40,000, then it was not quite so successful. If it had not been for this decrease, they would have had a larger margin of profit to give the proprietors, because it would be understood that, with an undertaking which had staff and office expenses and plant going at full cost, and at an increasing cost, a diminution of consumption further increased the cost per unit of output, so that a large reduction of sales was a serious blow which he always looked upon with some apprehension. So far as the present half year had gone, the returns showed that the loss would not recur. There would be a small loss in the present quarter; but by Midsummer (short of another coal crisis) they might be able to show a better account in the present half year. The Directors were unfortunately compelled, by the rise in the cost of wages and materials, to increase the price of gas by 3d. at Michaelmas. This was done lothfully and unwillingly. The dearest hope and strongest aspiration of the Directors was that, when they met the proprietors on this occasion, as the armistice was declared in November, they might have been able to announce that they were on the path of reducing the price of gas and raising the dividends, in respect of which they had some special impetus. But whatever they might find themselves able to do at that day's meeting, seeing that they were within a week of the most momentous question being settled as to the working of the coal mines, it would be sheer madness, and a disregard of the interests of the proprietors, to announce anything now in the way of a reduction, much as they wished to do it.

WIMBLEDON STOCK AND THE RELIEF ACT.

That they did wish to do it was shown by the clause in the report which told the proprietors that the application to the Board of Trade for relief under the Statutory Undertakings (Temporary Increase of Charges) Act, which was intended to relieve their Company like other companies, had failed to obtain the approval of the Board of Trade. There was only one class of stock which suffered at present, as compared with what the Relief Act would give. This was the Wimbledon stock, with the holders of which the Board very much sympathized, because, while the other classes of stockholders had not gone to the limit that demanded relief, the Wimbledon stock had done so. This dividend marked for the first time that the holders of the stock had a specially diminished income, in consequence of the price of gas. It seemed to him (they must all sympathize with this, and share the feeling) that it was very hard indeed that one class of stockholders should be getting worse hit than another by any hardship which affected the whole business. But it really arose from the lower standard price which was taken by the Mitcham and Wimbledon Company long before they came into the amalgamation with the Wandsworth Company. The report told them it was decided by the Board of Trade that the scope of the Relief Act did not allow of the amelioration of the condition of only one part of the stock, and not the whole; that there was not latitude, not power enough, in the Act to give special relief. They must therefore rely upon the relief which was to be expected now that the war was over, and that the submarine menace had passed. There were still plenty of mines floating about in the sea, as one of their captains only reported the day before; but insurances of coal freights were very much reduced, and ships were running much more freely than they did. Therefore, out of navigation costs, whatever the price of coals might be, they hoped to make considerable savings, and the present price of gas could not long continue.

HIGHER INTEREST CAPITAL.

The revenue account showed a profit of £30,000, which enabled the Directors to pay the dividends recommended in the report. He had shown how urgent was the pressure in the minds of the Directors, for the sake of the stockholders, to remove the disability incident to the present high price of gas in the district. The Directors regretted that it was high; for this was notably a low-priced Company. For several years indeed the price, as the proprietors knew, was down to 1s. 0d. per 1000 c.ft. The last time but one when they were in Parliament the price was at this figure; and it weighed very much with Parliament in giving the Company a good Bill. They were successful in their new Act of Parliament in getting power to raise capital temporarily at higher preferential rates of interest, instead of as formerly, at fixed rates on a permanent basis. The balance of unexpended or uncalled capital, £289,478, had now been put so that it might be issued as new ordinary or preference redeemable or irredeemable stock. This was a great facility, because it would be madness for them for the necessary expenditure of capital to raise money at (say) 5 p.ct. by preference stock, which would go on for all eternity, when the other classes of shares would be getting very much less in proportion.

CAPITAL EXPENDITURE.

Turning to the capital account, they had not been spending so much on meters and stoves for new consumers; and he was afraid that they would find these classes of goods would now always be very dear. They were double the price at which they used to be; and so probably they would not be able to continue to supply them at the present low rents. There was an item of £2457 for land. This was a piece of land at Epsom, which they acquired close to the works there. On buildings and plant £13,111 was spent. This referred to a new retort-house, which was started—all the plans were laid, and the foundations put in—in the early days of the war; and they had continued this scheme even through the war, because they could see no chance whatever that materials would be any cheaper after the war than before. Indeed, their prognostications in this direction had been verified. There were some very good judges in the room, who knew that all building materials—timber, metal, and bricks—had advanced something like threefold what they were even in the second year of the war. Therefore this policy, inasmuch as they could not meet their advancing business without the extra plant, was one of which the proprietors would approve, although, as he had always pointed out, the capital of the Company had not advanced at a greater rate than the business. This was, in his view, a cardinal point in good finance.

EXTRA UPKEEP COSTS.

With regard to the rest of the accounts, the working results were fair, looking at all the circumstances. They had been getting coal in all sorts of strange ways—largely by railways, which method had been discontinued years before the war—and these were expensive, tedious, and troublesome ways. They would find in the details of the accounts, such items as coal, wear and tear, labour, and materials were all extremely heavy, both in the manufacturing and distributing departments. This was inevitable; and something like £13,500 of the item for distribution was due to higher labour and materials costs over the ordinary upkeep. For other repairs, something like £10,000 had gone in the same way. If they reflected upon what this would have been in the ordinary course of things—had they not had to spend this £23,000 extra—they would see what the additional profit earning might have been. They would have had something like £30,000 of relief from these extra burdens.

REVISION OF FINANCIAL TERMS.

This was not a very exciting story to tell the proprietors. The Directors were keeping their eyes on the future returns and the increasing sales of gas, which they would be sure to revert to when they got to normal conditions. They would soon be considering putting before Parliament a rearrangement of the terms on which they operated, because the sliding-scale, adopted many years ago, and the standards of price and dividends, were extremely unlikely to be such as would serve their interests properly, looking to the permanent advances in wages and the cost of coal and essential materials. When the time came the proprietors would find the Board ready to address themselves to the proper quarter to have their financial position put on a better footing, because although they might hope to reduce the price of gas and raise the dividends, that they would ever raise them to the pitch they could have done but for the consequences of the war was quite out of the question. Therefore the Board would have to deal with the matter in the proprietors' interests by the aid of Parliament.

The Deputy-Chairman (Mr. R. Garraway Rice) seconded the motion.

The Wimbledon Stock and Relief.

Mr. Lindsay Davidson asked whether, when the Temporary Increase of Charges Act was before Parliament last year, it was pointed out to the Select Committee the hardship which would fall upon different classes of stockholders where there were different standard prices, as in their case.

The Chairman said the whole matter was put before the authorities. As President of the National Gas Council, he might say that they spent days with the Board of Trade, and laid extensive evidence before the Select Committee. The authorities did not allow them to proceed with their own Bills, but said that, as the question applied to many other gas companies, the matter would have to be dealt with in a General Act. They held out encouraging views to the companies, who thought they were going to get relief of a good character. They were never more astonished than when the Committee came to the conclusion to allow only half the standard or maximum dividends. Earnest representations were made to both Houses. A circular-letter was sent by the Council to the members of both Houses, showing how improper the proposal was. And, upon reconsideration, the half was altered to three-quarters; and beyond this they could not get them to go, although the Government themselves were paying 5 p.ct. for War Loans. He could assure the proprietors that no steps were lost in putting the full position before Parliament.

Mr. Pennell inquired whether the particular point as to a single class of stock not obtaining relief was considered by Parliament, or was it simply a matter of the construction of the Act. Apparently it had been held that their Wimbledon stock was to get no relief. Was this point taken up before the Parliamentary Committee, or had it simply arisen since?

The Chairman said it was considered to be involved in the whole case. The Directors thought they were getting it. There appeared to be no reason why the Wimbledon stock should not get it. The Board of Trade drafted the Bill; but they evidently overlooked this possibility. However, it might have been only because the Company amalgamated three classes of stock with three standard prices and dividends.

The motion was unanimously carried.

The Dividends.

On the proposition of the Chairman, seconded by the Deputy-Chairman, dividends were declared at the following statutory rates per annum: On the Wandsworth "A" stock 5½ p.ct.; on the Wandsworth "B" stock, 4 p.ct.; on the Wandsworth "C" stock, £3 17s. p.ct.; on the Wimbledon stock, £3 7s. 6d. p.ct.; on the Epsom stock, 4 p.ct.; and on the new ordinary stock, £3 17s. p.ct.

Re-Elections.

The Chairman moved, and Mr. W. G. Langlands seconded, the re-election of the retiring Directors (Messrs. R. Garraway Rice, J. Bromley Howell, F. H. Jones, and B. R. Green).

The motion having been carried, and acknowledgment made by the re-elected Directors,

On the proposition of Mr. Potter, seconded by Mr. Forbes, the retiring Auditor (Mr. H. Willis Smith) was reappointed.

Votes of Thanks—The Strike.

The Chairman said they must remember the strenuous efforts of their officers, staff, foremen, and employees generally. They had all been working their utmost through times which were so extraordinary, so abnormal, and so exciting, that he was sure the proprietors would appreciate the services they had rendered. There was also the question of maintaining stocks of necessary materials, and that of labour. He had in this connection an unfortunate confession to make. They had their works stopped for the best part of two days, not on account of any difference between the Company and the employees, but between the men who were in the Union and those who did not think they wanted to join the Union. Upon an appeal to the Board of Trade, the leader of the Union concerned came down to the works; and he was able to solve the difficulty, and to get the men to go back to their work. It was an unfortunate and sorrowful experience for the Directors, because he was bound to say they had a very fine set of men,

who had always treated the Company remarkably well. He sincerely hoped that nothing of the same sort would occur again. Like many other gas companies, they had been considering the question of discussing matters on occasion with the men; and he was glad to say a Committee had been formed of the men, officers, and Directors, who would meet from time to time to discuss questions that might arise. They had nearly 1300 men of various trades and classes with whom to deal; and he felt they had done their work exceedingly well. He regretted he could not couple with the vote the name of their Engineer, Mr. H. O. Carr, because (although he was included in the vote) he was not well enough to be present. The Assistant (Mr. C. M. Croft), who had been doing yeoman work all the time Mr. Carr had been absent, was present. In their stalwart friend, Mr. Braine, they had a very solid pillar indeed to support their interests and their financial and adminstrative operations. Therefore, they would give him and his staff, the engineer and his staff, and the workmen (in spite of the little mishap) very cordial recognition of their services.

The DEPUTY-CHAIRMAN seconded the motion, which was heartily passed.

Mr. BRAINE said that everybody, including the workmen, would, when they read his remarks, heartily appreciate the kindly terms in which the Chairman had proposed this vote. They were working in strenuous times; and they were all glad to see the old men coming back. They did not seem at all unwilling to do so. All the members of his own staff, and those of the Engineer's staff, worked honestly and well. He personally very much regretted the absence through illness of his colleague.

Proposed by Mr. W. RICHARDS, and seconded by Sir HERBERT BARTLETT, a cordial vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN having responded, the proceedings terminated.

HORNSEY GAS COMPANY.

The Half-Yearly Ordinary General Meeting of the Company was held on Friday, at No. 5, Great Winchester Street, E.C.—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. W. E. Roberts) read the notice convening the meeting; and the report and accounts were taken as read.

SATISFACTORY IN A VERY MARKED DEGREE.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was quite sure the proprietors would approve the view of the Directors that they were satisfactory in a very marked degree, whether on the ground of their integral merits or having regard to the circumstances and times from which they had been evolved. The report began with the admission of an adverse detail—and that was a decrease in the sale of gas of some 9 p.ct. as compared with the corresponding period of 1917. But coupled with this statement was the accurate explanation that it was entirely due to the rationing of gas as a fuel. He thought, having regard to the object to which this limitation was directed, it was very unfortunate indeed. It would have been better, he had no doubt at all, both in the public and national interest, if the use of gas had been left entirely unrestricted. When one reflected that the dominant economy in view was to get the greatest amount of public service out of a ton of coal, and when it was remembered that this ton of coal if passed through a gas-works gave four or five times the amount of light and heat to the community, as compared with its use—or he should say waste—on the ordinary consumer's open stove, one would think that the public interest would have been best consulted by allowing the gas companies to reduce to these economical forms of fuel the largest possible amount of coal they could get hold of. But this was not the policy; and he thought the criticism he had directed to the policy adopted found confirmation in the fact that the ration for gas had been very largely increased, and the public had already availed themselves of this enlargement of opportunity to a noticeable extent. Now, in so far as this reduction in the output of gas was an adverse feature in the Company's affairs, he was glad to be able to assure the proprietors that it had already passed away, and that with regard to the current period there was no decrease whatever. They were ahead of the corresponding period of the previous year, and they hoped to keep ahead. So that the one unsatisfactory detail which it was their duty to report that day might be said to no longer apply.

FEATURES OF THE ACCOUNTS.

In the report, it was also notified that the Directors had been compelled to raise the price of gas 3d. last September, to 3s. 4d. per 1000 c.ft.; and having regard to the very moderate figure this represented, he would for the moment make no further reference to it. Coming to the accounts themselves, as the result of their working to Dec. 31 the capital per million c.ft. of gas came out at £485. This they would recognize was a satisfactory figure, to the extent that it was upon the right side of £500; and this initial advantage had helped them with all the subsequent details of account. In the revenue account, they would see that the figures were based upon two selling prices for the respective quarters of the six months under review, and that they had only enjoyed the enhanced price of 3s. 4d. during the last three months of the year. This must be taken into consideration in connection with any favourable developments that might show themselves later. There was a noticeable improvement in the returns from residuals; and this was very gratifying, because it was the result of the treatment of residuals by the Company themselves under their recently acquired statutory powers. This result confirmed to the Directors the soundness of the policy in accordance with which these powers were sought and obtained. The return from residuals was nearly 16d. per 1000 c.ft. This was a large figure in these times, and it was further qualified by the fact that they were making a very considerable percentage of water gas. Had they made no water gas, the return would have been much larger. He only mentioned this, in case it might be sought to compare their figure with the return of companies who only manufactured coal gas. Of course, they got a corresponding advantage on the other side. The cost of raw materials for gas making was about 27d. per 1000 c.ft.; and the return from residuals brought the net coal figure to something like 11¼d., which in these times was an extremely favourable result—so favourable, indeed, that he ought perhaps to say it was a result that could only connect itself with companies who were working upon rail-borne coal under pre-war conditions. Because, roughly speaking, there was a difference of 10s. per ton in the period which they had now left behind them as between those utilizing sea-borne coal and those taking rail-borne coal. The balance was formerly quite the other way about. But it might be reckoned that sea-borne coal had been some 10s. per ton dearer in the half year they were now considering. Therefore any return from residuals, or net cost of coal per 1000 c.ft. of gas, should only be compared with the figures of companies working under common conditions with themselves. A satisfactory item was carbonizing wages, which approximated, after certain deductions were made, to 2½d. per 1000 c.ft. This was an extremely fine figure, and reflected great credit upon their Engineer and General Manager (Mr. J. W. Buckley) in these difficult times. In fact, the whole series of items reflected this credit. Of course, he had a modern works, with the latest form of equipment, and the advantages accruing from having reconstructed the works largely during the period of the war. But the best tools in the world were of no use to a bad workman; and the excellent accounts that were now before them could, as he had said, only be referred to as redounding to Mr. Buckley's credit. The items of repairs and maintenance had been looked after to a degree which was quite satisfactory, whether to their Auditors or to any other critic. It might be thought that the amount charged to stoves and fittings was rather low. So it was, comparatively; but the fact was that so much was depreciated off these in the past that they did not require a heavy figure to bring them into proper comparison with companies who had not written off quite so much in the past, or whose accounts ante-dated theirs by going back a larger number of years. The epitome of the statement was that they had received some £741 more, and the expenditure had been £767 greater; the profit being £25 less. Coming to the profit and loss account, the satisfactory deduction from these working figures became apparent. They had as the result of the profit brought from the revenue account and a small matter of interest, some £8669 to deal with. They required for interest, income-tax, and dividend together about £8336; so that the net result of the year's working had been that they had a surplus of £333, after meeting all charges, with which to augment the carry forward of the past half year. Coming at this particular time, he thought they would agree that such a result was very gratifying. The special purposes fund to a certain extent stood in the place of the more substantial reserve fund. They would probably agree with him that there were few companies at the present time who had less reason to regard a reserve fund as a necessary incident to their accounts. So far as they were concerned, it did not look as though they were likely to be called upon to avail themselves of the reserve either at present or in the immediate future.

CHEAPEST GAS IN LONDON OR THE SUBURBS.

So much for the report and accounts. The circumstances and conditions affecting their industry were so numerous that he could not attempt to deal with them all. With regard to labour, their troubles were the general troubles. They could not evade difficulties as they occurred; and they had to accept the settlement of these difficulties which was now meted-out in gross to the gas industry generally—and not to the gas industry alone, but to every other form of industry as well. Everything that was done re-acted throughout the whole industrial system; and they were affected by it, quite apart from their special circumstances. There were many things that gave great encouragement in connection with their undertaking; and one was the selling price of gas. Some years ago, he pointed out that they were in the fortunate position of being able to sell the cheapest gas in the whole Metropolis; and they were still able to do so to-day. Notwithstanding the increase to which he referred, theirs was still the lowest price at which gas was sold in London, or in the suburbs of London. And the Directors were very glad this was so; for it was a great source of security to them. It was of great value to them in prospective relation to their business. Theirs was a competitive business almost to the same extent as if they were acting without statutory regulation or protection. As a matter of fact, they had had more of regulation and less of protection lately than any other statutory industry he knew of.

GOVERNMENT ELECTRICITY SCHEMES.

Now they had been made acquainted—he might almost say threatened—with a prospective huge development of their chief opponent, electricity. The Government had referred in vague, but rather grandiloquent, terms to the reconstitution of the electrical industry on a different basis, and upon a very much larger scale with regard to centres of distribution. This had been interpreted by a good many people as constituting a very direct menace to the gas industry; but in the provision and distribution of light and heat having for its common source coal, the production of gas was a tremendously greater economy than the production of electricity. This was their basic protection in competition with electricity. When treating a ton of coal in a gas-works, something like seven or eight times the amount of heat was developed that could be obtained by treating it through the medium of an electricity works. Therefore, in the supply of light and heat on an economic basis, he did not think they had a great deal to fear. He rather believed the economic and immediate prospect in connection with this contemplated electrical development was the cheapening of the production of electricity as compared with its cost to-day. In other words, it would be competition of the new electrical production with the old electrical production. It appeared to him that the advantages of any such new electrical development must be confined in an intense degree to the zones within which the electricity was developed—that the immediate effect would be more marked in the great coalfields where the electricity was produced than in remote southern districts, in regard to which all the problems of distribution and transmission would have to be faced, or the initial advantage of using the coal where it was raised would have to be sacrificed. The facts he had

pointed out in regard to the advantages of gas from the economic standpoint should tend to re-assure them as to the future.

The Deputy-Chairman (Mr. A. F. Phillips) seconded the motion, which was agreed to without discussion.

The Dividend.

The Chairman proposed: "That the sum of £1645 16s., less income-tax, for the payment of the half-year's interest on £65,832 5 p.ct. preference stock to Dec. 31, 1918, be set apart, and that the same be paid accordingly; and that a dividend at the rate of 11¼ p.ct. per annum on the 10 p.ct. "A" stock, and at the rate of 8¼ p.ct. per annum on the 7 p.ct. consolidated stock for the half year ended Dec. 31, 1918, subject to income-tax, be, and is hereby, declared payable."

Mr. J. M. Miles seconded this proposition; and it was carried.

Re-Elections of Directors and Auditor.

On the motion of Mr. Phillips, seconded by Mr. F. H. Jones, the retiring Directors (Messrs. A. M. Paddon and G. W. Carey) were re-elected; as was also the retiring Auditor (Mr. E. L. Burton), on the proposition of Mr. E. Drew.

Votes of Thanks.

The Chairman proposed a hearty vote of thanks to the Engineer and General Manager, the Secretary, and the other officers and the staff, for their services to the Company. He remarked that everything he had said in moving the adoption of the report and accounts was in direct support of such a resolution. The accounts were good; and the results were undoubtedly primarily—and, indeed, almost entirely—due to the great skill and energy of Mr. Buckley. He had, of course, a good works in very fine order, with the latest plant; but, then, even these factors were very largely due to Mr. Buckley himself. He had been on the spot when every detail of the works was installed; and great credit was due to him for the design and arrangement of the works, but above all for the use he made of the means put to his hand. Mr. Roberts, too, had shown the greatest interest in the Company's affairs; and to him nothing was a trouble.

Mr. Joseph Cash seconded the vote; remarking that there were various difficulties ahead, and he could only hope that Mr. Buckley would be able to steer their good ship through any storms to come as well as he had done in the past.

Mr. Buckley, in acknowledging the resolution, said the officials did in some measure feel proud of the position of the Company. They were proud of the fact that they were selling the cheapest gas in the neighbourhood; and they were also proud of the fact that the shareholders were so well satisfied with their dividends. They felt that, with the able assistance of the Board, they would steer the ship safely through any storms that might arise. No doubt, there were difficulties ahead; but they were hopeful that the time might arrive when things would be very much more easy than at the present time.

The meeting concluded with a cordial vote of thanks to the Chairman and Directors, on the proposition of Mr. Burton.

CROYDON GAS COMPANY.

Effect of the Lighting and Heating Restrictions.

The Half-Yearly Meeting of the Company was held at the Offices, Katharine Street, Croydon, on the 21st ult.—Mr. C. Hussey, J.P. (the Chairman), presiding.

The Chairman, in moving the adoption of the report and accounts, said the proprietors would see from the accounts that the output of gas had decreased by nearly 10 p.ct. as compared with the corresponding half of 1917. This had been brought about by the restrictions imposed by the Government under the Household Fuel and Lighting Order. He did not in any way question the necessity under which they acted—and, indeed, had the demand for gas in the depth of the winter shown the increase to which the Company were accustomed, the difficulties of their Engineer (Mr. A. Caddick), great enough already, might have proved almost insurmountable. As it was, they had had anxious times in view of restricted supplies of coal. Of course, any considerable decrease in sales of gas resulted necessarily in an increased cost of standing charges on what was sold. Considering the high prices of coal and of all materials used in carrying on the business, as well as the great increase under the head of wages, he thought they would agree that the results shown in the accounts for the half year were satisfactory. The expenditure under the head of distribution had reached a very low figure compared with what it was before the war. This expenditure was governed largely by the amount of work which could be done by way of extension of the business; and when they could again begin to increase their sales freely, it would, no doubt, go up. Residuals had realized fairly good prices, though dealings in them had largely been controlled. In the case of coke, they had endeavoured to work with the local merchants, and in this way to ensure to residents in the district facilities for the use of this valuable and smokeless fuel. These efforts had met with considerable success; and in the past half year more than two-thirds of the coke for sale had been used, so to speak, at home. With regard to sulphate of ammonia also, sales had been, and were being, made wholly to farmers in the near neighbourhood. Farmers, who found it impossible to obtain imported fertilizers, were now beginning to appreciate the value of sulphate; and in this way the Company had been able to lay the foundations of a local demand which should stand them in good stead when they again experienced the fierce competition which was depressing prices before the war. It seemed strange that many hundreds of tons of a valuable fertilizer produced in Croydon should be shipped to Spain, Japan, and elsewhere abroad, while large quantities of less valuable manure were brought into the district from South America. In the future, he hoped this would happen to a less extent. The dividends had not been quite earned in the half year. It had been necessary to take £630 out of the amount brought forward, leaving £3673 to carry forward, after paying the dividends, amounting to £20,740. Many people had erroneous ideas on the subject of gas dividends. It was far from being the case that they represented large sums received by wealthy people. As a matter of fact, their own dividends for last half year, when divided among 2240 proprietors, gave to each an average income, before deduction of tax, of just 7s. per week. One shilling per day—less than an Old-Age Pension—was not a princely reward to those who had found the money that enabled the Company's business to be carried on. It was with much regret that the Directors found themselves obliged to increase the price of gas 2d. as from January; but it was a necessary precaution, in face of the continued rise in the price of coal, materials, and wages. Their total increase in price, as compared with that before the war, was to-day less, relatively as well as actually, than that of most of their neighbours. The record of the employees in the war was one they were all justly proud of. More than 250 had from first to last left the comforts of home to face danger and hardship for their country's sake; and 25 had given their lives on sea or land. He could not omit a word of appreciation of the help they had had from many men and women—especially the latter—who had come in a temporary capacity, and helped to carry on. He believed that the gas industry had before it, given fair treatment by the authorities, as great possibilities of usefulness to the community, and of profitable development, as ever it had. In regard to heating and cooking, no agency was in sight which had any chance of competing in cost and convenience. The industrial uses to which it could be put were constantly increasing; while for lighting and power it had still a great future before it.

The motion was unanimously adopted.

Mr. W. Cash proposed dividends, less income-tax, on the "A" stock, at the rate of 12½ p.ct.; "B" and "C" stocks, 9¼ p.ct.; "D" stock, 5 p.ct.; and "E" stock, 9½ p.ct. He pointed out that these were the statutory dividends.

Mr. H. Woodall, in seconding, spoke in high praise of the condition of the works which he had visited.

The resolution was carried, and Mr. Hussey was re-elected a Director.

The Chairman, in acknowledgment, said he had been a Director for 29 years and, by the kindness of his fellow Directors, Chairman for 27 years. During nearly the whole of this time, they had never had the anxiety they had had during the last year or two.

Mr. S. Spencer (who was also re-elected a Director) said that he first visited Croydon in 1860, when the works were at Pitlake. Since then he had kept in close touch with them.

The retiring Auditor (Mr. J. Jones) was re-appointed; and the proceedings closed with votes of thanks to Chairman, Directors, and staff. The last-named vote was responded to by Mr. A. Caddick (Engineer), Mr. W. W. Topley (Secretary), and Mr. W. J. Sandeman (Distributing Engineer).

SOUTH SHIELDS GAS COMPANY.

The Past and the Future.

The Annual Meeting of the South Shields Gas Company was presided over by Mr. James Readhead, who, in moving the adoption of the report and accounts, said that, having regard to all the exceptional circumstances, he thought the shareholders would admit that the Directors had done their work satisfactorily. He was not going to compare their accounts with those of any other company; but shareholders who had interests in other similar undertakings would give them credit for doing as well as any other undertaking. The total income for the year was £149,559, which showed an increase over the previous year of £25,667. The expenditure account for the year was £131,191, being an increase of £22,658 over the previous year. This additional expenditure, in comparison with 1917, was owing in great measure to the extra price paid for coals. The costs of all materials were considerably increased; and wages were several times advanced. The wages bill for the year 1918 amounted to £41,334, and was an increase of £6179 over the previous year. In addition to what had already been done in respect to increasing wages, there were at the present moment further applications for increases and for reductions in working hours to be negotiated upon. These additional payments, like all other working costs, had to be met either by increased output or by an increase in gas prices. The profit earned for the year was £18,368, from which dividends and interest on temporary deposits and mortgages were to be provided. Thereafter £3504 remained as surplus on the year. But as the Company's investments in Consols had depreciated by reason of the price of Consols falling, it was recommended that the amount of depreciation be dealt with in the year's accounts, and the surplus of £3067 be added to the carry forward.

During the second half of the year, the Board of Trade issued the Household Fuel and Lighting Order; but irrespective of the effects of the Order, the sales for last year had increased 27¾ million c.ft., equalling an increase of a little under 5 p.ct. in comparison with the previous year. The sales of 1918 were the highest attained during the war period, but were about 6 million c.ft. less than the previous highest record, which was in the year 1914. Throughout the whole year their anxiety had been considerable. The coal position towards the end of 1918 was looking very serious, owing to the difficulty of obtaining the supply necessary for the regular manufacturing requirements. It was very fortunate that they had been able previously to have in store a reasonable quantity, and in consequence were able to meet all requirements in gas demands. The coal stocks had been decreased by over 4000 tons since the beginning of 1918. The position now, however, had been slightly relieved; and their supplies were coming forward more regularly.

In conclusion, he paid a high tribute to the work of the late Engineer, Mr. Thos. H. Duxbury, and stated that the staff and the workmen had served them loyally and faithfully. He particularly acknowledged the faithful service of the Secretary (Mr. A. Pickering).

The adoption of the report was agreed to, and a dividend was declared equal to 5¼ p.ct. on the consolidated and new stocks and 4½ p.ct. upon the ordinary stock.

BARNET DISTRICT GAS AND WATER COMPANY.

Satisfactory Results under War-Time Conditions.

The Half-Yearly Meeting of the Company was held on Monday last week, at the Offices, No. 139, Cannon Street, E.C.—Mr. A. F. PHILLIPS in the chair.

The SECRETARY (Mr. Ernest F. Drew, F.C.A.) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the capital account of both the gas and water undertakings stood the same as for the half year ended June 30 last. There had been neither addition to, nor deduction from, the amounts then expended. There was a decrease of 18·4 p.ct. in the quantity of gas sold, compared with the corresponding half year. As the district supplied with gas was a residential one without any considerable industry to use gas, the reduced consumption was undoubtedly due to the restriction of the Fuel and Lighting Rationing Order, and would probably be recovered when the restrictions were removed. Fortunately, the Company for some time held a stock of coal acquired at reasonable prices which had contributed to meet the consequent loss of revenue for the past half year. The cost of coal and oil, owing to this and the reduced quantity used, was £11,418, against £11,831. Wages had risen considerably; being for carbonizing only £1571, against £1101. The expenditure on stoves and fittings was only £140, against £1046; little work having been done on the distribution. The rest of the expenditure was much the same as in the corresponding half year. The total receipts were also much the same—£25,795, compared with £26,707; and the balance of profit was £3499, which was £2061 less than the half year ended June 30 last. The water revenue was approximately the same—£25,712; and it resulted in a profit of £14,269. The profit and loss account showed that, adding the balances from the water and gas undertakings to the balance brought forward, and deducting income-tax and interest on loans and debentures, there was an available balance of £35,466. The amount required for the proposed dividend was £10,383; leaving £25,083 to carry forward. The results of the half year must be considered satisfactory. The Company were able to maintain the usual dividend and slightly increase the carry-forward; but, realizing that future expenses, owing to the great increase in the cost of coal and all other material, as well as wages, would be considerable, the Directors felt they had no alternative but to give notice to increase the price of gas 4d. per 1000 c.ft. from Christmas last. The consumers might rely upon it that, as soon as the Directors felt justified in doing so, the price would be reduced. While the price of coal had increased by over 60 p.ct., retorts and other material by over 100 p.ct., and wages by over 80 p.ct., the price of gas had only been advanced by 30 p.ct. The past half year, and especially the present times, were filled with anxiety to the gas industry generally, and Barnet had its share. The management had to contend with the great trouble in obtaining supplies of coal, and the labour question was ever before them, with its many demands to meet and solve. He was, however, pleased to say that, on the whole, the staff and workmen had satisfactorily carried out their duties; and the Directors hoped the good relations of the past would continue. The Company had had some of their coal supplies diverted to other works; and they were being replaced with coal from other sources. The Board recognized the condition of the country had been so critical that the Coal Controller was obliged to adopt such a policy; but it was somewhat hard on the Company, after exercising every care to provide a good stock of coal, that they should have to bear this additional expense. The Company's water business, which was the more important, continued satisfactory, though the revenue showed only a slight increase due to no new houses being erected. Wages and fuel were more by £339. The plant of the gas and water works had been maintained in a thoroughly satisfactory state.

The DEPUTY-CHAIRMAN (Dr. J. W. L. Glaisher, F.R.S.) seconded the motion, which was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. COLIN DOCWRA, dividends were declared, less income-tax, for the half year, at the rates per annum of 9 p.ct. on the "A" and "C" stocks, 8 p.ct. on the "B" stock, and £6 6s. p.ct. on the "D" capital gas and water stocks.

Moved by the CHAIRMAN, and seconded by Mr. ALFRED WOOD, the retiring Directors (Dr. Glaisher and Mr. J. E. Plummer) were re-elected.

Dr. GLAISHER, in his acknowledgment, said it was a very great pleasure to serve the Company. It was thirty years since, in his father's time, that he was elected a Director of the Company. Looking at the balance-sheet, it was seen that they had not yet reached the payment of their statutory dividends, which was the ambition of his father; but though they had not yet accomplished this, it was not for want of good management. During the four trying years of war, the work had been greatly lightened by having Mr. Phillips as Chairman. If they had not had him in the chair, the anxiety of the Directors would have been greater than it had been.

On the motion of Mr. W. RICHARDS, seconded by Mr. F. R. SMITH, Mr. C. P. Crookenden was reappointed Auditor.

The CHAIRMAN moved a hearty vote of thanks to the Secretary (Mr. Drew), the Engineer and Manager (Mr. F. J. Bancroft), their staffs, and the employees generally. He referred to the unusual anxiety of the officials. Mr. Bancroft had had the greatest difficulty in obtaining the necessary amount of coal; and labour troubles had been ever with him. He had had many difficult problems to solve, which the Directors exceedingly regretted, because they were always disposed to treat the staff and employees justly and liberally; and they did think that sometimes the demands made upon them were unreasonable. Still they appreciated the services rendered them by their employees during the past year: and it was hoped that they would all remain loyal and faithful to their duties.

Mr. SMITH seconded the motion, which was heartily carried.

Mr. DREW and Mr. BANCROFT having responded,

A cordial vote of thanks was passed to the Chairman and Directors, on the motion of Mr. J. S. INESON, seconded by Mr. SAMUEL CUTLER, jun.

YORKSHIRE GAS POWER AND BYE-PRODUCTS COMPANY.

In the "JOURNAL" for Feb. 18 [p. 342], reference was made to this Company. Additional information is that it is probable the Company will soon be making a start. It will be linking-up with one of the leading oil companies, which is arranging to erect the oil-rectifying plant at their own expense, and will take all the crude oil produced by the Company. Dr. Dunstan is taking great interest in the new development. To it the attention of our readers will be more particularly drawn by the article (commenced last week, and concluded this week) which Mr. F. D. Marshall, who, as our previous reference to the new Company showed, is one of the Directors of the Company, has contributed to our columns. In this connection, the "Iron and Coal Trades Review" writes: "The process described by Mr. Marshall is to be tried on the new plant of the Yorkshire Gas Power and Bye-Products Company, with a capital of £700,000, formed for the treatment of coal by low-temperature carbonization, on the site of the Holmes and Jordan Colliery Company, Ltd., near Rotherham. The carbonized fuel is to be subjected thereafter to ordinary treatment in bye-product recovery producers; and contracts have been entered into for the supply of the resulting gas to the steel-works of Messrs. Steel, Peech, and Tozer, and also to the Rotherham Corporation. The first unit will treat 120,000 tons of coal per annum. The Holmes and Jordan Colliery is at present closed-down; but is to be re-opened by the Bye-Products Company, who will control the colliery. Mr. George Blake Walker estimates the output of the pit at 1500 tons per day, when fully working."

GAS-WORKS FATALITY AT BIRMINGHAM.

Four Men Killed.

An alarming occurrence, due to an escape of gas, involving the death of four men—two workmen and two firemen—took place last Wednesday afternoon at the Nechells Gas-Works of the Birmingham Corporation. The men killed were: Robert Humphrey Davey (34), Harry John Ward (18)) gas-fitters, and Acting Station Fire Officer Moon and fireman Herbert Dyche.

The accident occurred in the governor-house. Davey and Ward were working in a basement, carrying out repairs to a governor, which had been receiving attention for over a month. The valve shutting-off the governor had held reasonably well closed—though it was not "dead shut;" and this fact was confirmed upon examination on Tuesday. It was not touched at all on Wednesday; but for some reason, at present unexplained, the valves suddenly failed to hold. The consequence was that the basement, in which the two gas workers were engaged, became more or less filled with gas. The velocity was exceptionally high—indeed, the volume was not particularly great. In the opinion of the experts, the rapidity with which the men were overcome was due to the fact that as they were descending into the basement they were met by the full force of the gas.

Immediately the escape was discovered, Mr. Tomlinson, the Engineer of the works, entered the building, and he was completely overcome, as was also Mr. Browning, his Assistant. Aid was sought from the adjacent gas-works at Saltley and Nechells; and the officials, who were soon on the spot, as well as a number of workmen, were also affected by the fumes. Five men, including two firemen, were detained for a time at the General Hospital. Chief Fire Officer Tozer was also affected. The firemen who lost their lives wore anti-gas helmets, and so did other men. It is thought that the high velocity of the escaping gas may afford some explanation for their failure. The windows of the governor-house were smashed in order to liberate the fumes; and holes were also bored in the main. The flow was arrested by bladders. The bodies of the workmen and the firemen were not recovered for over three hours.

Sir Hallewell Rogers, M.P., the Chairman of the Gas Committee, who was in London on his parliamentary duties, wired expressing his sympathy with the relatives; and a public statement was made by Mr. Tomlinson and Mr. A. W. Smith, the Secretary of the Department, expressing, on behalf of the Department, warm appreciation of the splendid work and loyal co-operation of the officials and men of the Department, of the Fire Brigade, the gas-works ambulance, and others.

The inquest on the bodies of the unfortunate men was opened last Friday by the City Coroner (Mr. I. Bradley) and, after evidence of identification, was adjourned until Thursday, the 13th inst.

Mr. F. H. C. Wiltshire, Acting Town Clerk, expressed, on behalf of the Corporation, and in particular the Gas Committee, their deep regret at the accident, and sympathy with the wives and families of the men. He emphasized the remarkable heroism and bravery displayed by the fire brigade, the staff engaged at Nechells, the officials, and the ambulance men, whose efforts helped very largely in effecting prompt rescues and reducing the number of casualties.

On Saturday, it was reported that 17 firemen had sufficiently recovered from gassing to be able to resume their duties.

Maximum Price at Glasgow.—In view of the probable continuance for some time of the abnormal price of coal and high maintenance charges and wages, the Glasgow Corporation Gas Committee recommend application being made for power to increase the maximum price of gas.

STREET LIGHTING IN WESTMINSTER.

The Westminster City Council recently decided to make formal representations to the Home Office with a view to the removal of restrictions on public lighting so far as to permit the Council to arrange for increased lighting to be given in the principal thoroughfares of the city.

Now the Works Committee report the receipt of a reply from the Home Office, stating that all Home Office Orders restricting street lighting have been revoked; and the matter is now regulated by the Board of Trade, who are responsible for the measures for securing economy in the use of fuel. It will be quite in order for the Council to bring into lighting such street-lamps as they think fit, provided the total amounts of gas and electricity consumed do not exceed one-half the normal pre-war consumption. The street lighting in Westminster at the present time is less than 50 p.ct. of the pre-war standard; and now that the necessity for darkening the streets has passed, the Committee are of opinion that authority should be given at once to revert to the pre-war scale in regard to the streets forming omnibus routes. The City Engineer has been in communication with the Gas Light and Coke Company, who state that there would be no difficulty in reverting to the pre-war scale of lighting on omnibus routes, and that the increased cost would be about £3500 per annum. The Committee refer to the inferior quality of gas, which it appears to them ought to be improved now that the necessity for extracting certain constituents for war purposes no longer exists.

The Council have decided that representations be made to the Board of Trade, with a view to authority being given enabling the Council to revert to the pre-war standard of lighting in those streets of the City forming omnibus routes, and that reference be made to the desirability of bringing pressure to bear upon the Gas Company, with a view to the lighting and calorific power of the gas being at once improved.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate, &c.

London, *March* 3.

Pitch continues to be shipped in very satisfactory quantities, and the price is firm at not below 65s. net per ton f.o.b. makers' works. The demand for solvent naphtha and toluol is small, and prices are nominal. Benzol is going readily into use for motor purposes, and the best quality is much appreciated by car owners. Sixties crude acid has no market at present. Creosote is quoted at 6d. to 6¼d. net per gallon in bulk for large lots, *ex* producers' works.

There is nothing new in the position of sulphate of ammonia. The last quarter of the year of Government control commenced on the 1st inst.

Tar Products in the Provinces.

March 3.

The average values for gas-works products during the week were: Gas-works coal tar, 36s. to 41s. Pitch, East Coast, 47s. 6d. to 50s. per ton f.a.s.; West Coast—Manchester 45s. to 46s., Liverpool 45s. to 46s., Clyde 45s. to 46s. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 10d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 8¼d. to 8½d. Solvent naphtha, naked, North, 2s. 5d. to 2s. 6d. Heavy naphtha, North, 2s. 11d. to 3s. Creosote, in bulk, North, 5d. to 5¼d. Heavy oils, in bulk, North, 6¼d. to 7d. Carbolic acid, 60 p.ct., unsaleable. Naphthalene, £20 to £25; salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per minimum 40 p.ct.; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

The amount of business done in tar products since the last report is much smaller than for a considerable time past. There have been no special developments, and prices exhibit rather less change than usual. The tendency of pitch is still very firm, and good business is passing in London. In the Provinces, conditions tend towards gradual improvement. Dehydrated tars are in good request; and the strength of creosote provides an exception to the week's dullness. There is undoubtedly an enormous amount of creosoting work to be done throughout the world; but the question of price has to be considered. At present, it would probably be difficult to buy any quantity at under 6¼d. per gallon, which is a high price. Nevertheless, a good many people believe a further large advance is to come. Carbolic acid remains quite unsaleable, and quotations are purely nominal. In commenting on this product last week, I was, by error, made to say that if makers of crystal could buy crudes at 1s. to 1s. 3d. per gallon they should be able to produce crystals at 4½d. per gallon. This should, of course, be per pound. Toluol remains without change; but benzols are slightly on the dull side after their long period of activity since the removal of restrictions. But while the spirit compares favourably with petrol, there is no reason to anticipate a decline in value. If and when American petrol is imported again in heavy quantities and the price falls to a reasonable level, benzol will have to compete. Meanwhile, however, the National Benzol Association is arranging to standardize the product, and also to carry out distribution for the trade, which should accordingly be in a strong position to meet the competition—when it comes. Crude naphthalenes are without change; but refined is being offered at lower figures, and values are even expected to decline further. Cresylic acid is rather better in tone; but solvent naphtha still continues dull. Other products call for no special comment.

The range of home quotations is as follows:

Benzol: 90% London, 2s. 3d. to 2s. 6d. per gallon; 50-90%, 1s. 9d. to 2s. 3d. per gallon.

Carbolic Acid: Crude 60's 1s. 3d. per gallon; crystals 40% 7d. per lb.; pale liquid 98-99 p.ct., 3s. 8d. per gallon.

Crude Tar: London 40s. to 41s.; Midlands 34s. to 36s.; North 35s. per ton *ex* works.

Pitch: London, 67s. 6d. to 70s. per ton; East Coast, 47s. to 49s. per ton; West Coast 44s. to 45s., with Manchester 42s. per ton and Glasgow 47s. 6d. per ton; South Wales, 55s. per ton.

Solvent Naphtha: London 2s. 8d. to 3s. Provinces average 2s. 7d. per gallon.

Crude Naphtha: Naked 1s. per gallon.

Heavy Naphtha: 2s. 8d. per gallon.

Naphthalene: Refined £25 per ton nominal; crude £7 to £13 10s. according to quality.

Toluol: Naked, 2s. 9d. to 3s. per gallon nominal.

Creosote: London 6½d., North 5½d.; heavy oil, 7¼d. per gallon in bulk.

Anthracene: 40-45%, 4½d. to 8d. per unit per cwt.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95% 2s. 9d. to 3s.; 97-99% 3s. to 3s. 3d. *ex* works London; f.o.b. other ports.

Sulphate of Ammonia.

This product is moving very freely. In addition to gas-works outputs, bye-product coke-ovens are generally reported to be working well, and the output of sulphate is rather heavier; but the demand readily absorbs all supplies. The export position is said to be better; but no increase in this branch of the trade is likely to be allowed while the home demand remains so active. Home supplies, however, may receive considerable augmentation in the future if the Government proposals for centralized power generation are adopted; the recovery of ammonia, it is understood, forming one of the features of such proposals. This would just about give the finishing touch to all synthetic ammonia schemes, as the large capital necessary for the equipment of synthetic production plant would hardly be available if increased production and falling prices—which would follow—are likely to result from the power centralization scheme. The future, undoubtedly, requires the closest attention by all concerned. In America, prices are unchanged, although there are now practically no forward sales.

A correspondent writes: I feel bound to enter a protest against the prices which your "Market Correspondent" is quoting in the "Journal." Take the issue for Feb. 18. He quotes benzol in London 2s. 3d. to 2s. 6d. a gallon; whereas for any quantity not more than 2s. to 2s. 1d. can be obtained. He quotes toluol at 2s. 9d. to 3s.; whereas this article is worth no more than benzol. It is, in fact, being mixed with benzol to ensure that it shall not freeze when used in a motor-car. 50/90's benzol is a mixture of benzol and toluol, and should have the same value as benzol. Yet your correspondent only gives it a value of 1s. 9d. to 2s. 3d. In other words, for benzol alone he puts a maximum price of 2s. 6d.; for toluol alone a maximum price of 3s.; but for the two mixed, a price of 2s. 3d., which is absurd. Crude carbolic acid is absolutely unsaleable; and yet he quotes 1s. 6d. a gallon. There have been sellers at 1s. without success. He quotes crystals one week at 1s.; and the next week at 7d. One price, I contend, is as foolish as the other. He quotes pale liquid carbolic (by which, it is presumed, he refers to the trade term for pale cresylic acid) at 3s. 8d. per gallon. Yet under the denomination of 97/99 p.ct. cresylic, he only values it at 3s. to 3s. 3d. He quotes pitch at 67s. 6d. to 70s. London. There are sellers at 65s. His figure for solvent naphtha of 3s. to 3s. 3d. London, and 2s. 9d. Provinces is ridiculous. One can buy at 2s. 8d. in London without difficulty; and in the Provinces at about 2s. 3d. to 2s. 6d. It is very doubtful whether £20 per ton could be obtained for any quantity of naphthalene. Creosote in London is over 6d. a gallon. Producers of tar look at the figures quoted in the "Journal," and value their tar accordingly; and they are naturally surprised when the tar distiller is unable to give them the figure which they ask, and think they are being misled when the tar distiller tells them the prices which he is actually getting for his production.

Appointment of a Managing-Director at Ilfracombe.—Mr. R. M. Rowe presided at the annual meeting of the Ilfracombe Gas Company on Thursday last. The accounts showed an available balance of £1485, after paying an interim dividend of 2½ p.ct. It was decided to pay a further dividend of like amount—making the full statutory dividend for the year. The Directors reported that a vacancy on the Board had been filled by the appointment of Mr. J. Armstrong, who for a long period has been Manager and General Secretary of the Company, as Managing-Director. By this appointment, the services of Mr. Armstrong would be secured for the Company. It the course of the proceedings, the hope was expressed that the time would soon arrive when normal conditions would again prevail in the gas industry.

Sheffield Gas-Workers' Wages.—The result of an interview with the Sheffield Gas Company over the wages question was presented by Mr. C. H. Blackburn (District Secretary of the National Union of General Workers) to a meeting of the employees on Friday night. Mr. Blackburn explained, with regard to the conference with the Directors of the Gas Company, that the question of a 44-hour week had been adjourned for further consideration. With regard to wages, the understanding arrived at was that 5s. per week increase be paid to men and women eighteen years of age and over, at the rate of 10d. per day or shift, for each day or shift worked. A gas stoker is to be paid 10d. extra for every shift. Those under eighteen years of age are to have 2s. 6d. a week, or 5d. per day; and piece workers, 5s. per week. These concessions would bring the labourers' rate up to £3 0s. 5d. per week; and the Company were to pay back money from Feb. 1. The position was discussed; and ultimately the terms arranged were accepted—the question of hours being left over.

Chester United Gas Company.

The half-yearly report was submitted to the shareholders in the Chester Gas Company by Mr. H. J. Birch (the Deputy-Chairman), who presided in the absence through indisposition of Sir John M. Frost. He said the accounts were satisfactory, in so far as they showed sufficient profit had been made to provide for the dividend allowed by the Company's Act. Though the Fuel and Lighting Order had resulted in a falling-off of sales to the extent of 5·08 p.ct., the receipts were £3575 more, owing to the higher price charged. Altogether the receipts were increased by £4130, of which sum working expenses had absorbed a large proportion. The result was a profit of £5919, which would leave a balance of about £400 to carry forward, after meeting interest and dividend charges. Since 1913, the cost of manufacturing gas, exclusive of the cost of coal, had risen 76·4 p.ct.; distribution costs had risen 11·3 p.ct.; rents and rates, 12·9 p.ct.; and management, 9 p.ct. Coal had cost 61 p.ct. more; but there was a set-off against this in a larger return from residuals of 27 p.ct. These additional charges had increased the net cost of gas delivered to the consumers by no less than 59·5 p.ct.; and therefore they had done well to manage with an increase of only 50 p.ct. in the charge for gas supplied. He was sure everything possible would be done to develop and strengthen the spirit which makes for progress in the industry, the prosperity of the workers engaged in it, and the advantage of the community who are supplied by the Company with one of their essential needs. The report was adopted, and a dividend making a total of 5 p.ct. for the year on the ordinary stock was declared.

Estimated Deficit at Devonport.—The Plymouth Corporation Gas Committee had under consideration last Thursday the estimates for the coming financial year of the Devonport gas undertaking. The income is estimated at £141,827, as compared with £134,399 for the present year; and the expenditure at £147,349, against £134,383. The estimated deficit is thus £5522, compared with an estimated surplus of £16 for this year.

Carburetted Hydrogen Plant at Frodsham.—The Frodsham Gas and Water Company held their annual meeting on the 20th ult., when a dividend of 9 p.ct. on the "A" shares, and 6 p.ct. on the "B" shares was declared. After the meeting, the shareholders were invited to inspect the working of Tully's carburetted hydrogen plant. The shareholders congratulated Mr. Ernest Frith, the Engineer and Secretary, on the way in which the work was carried out, and the smooth and satisfactory running of the plant. Mr. Frith explained that the plant has been erected entirely by his own staff, as they could be spared from other work; the special castings, valves, doors, and fittings only being supplied by the contractors. Had the plant been finished a few months earlier, a saving of several hundreds of pounds would have been effected; as it was, he anticipated going ahead without having to further increase the price of gas, and to pay the full statutory dividends, and make good the drawings from profit and loss account.

Fatal Escape from a Gas-Main.—At Scarborough, a man was found dead in bed, and his wife unconscious; and the verdict of the Coroner's Jury was "Death from coal-gas poisoning," with a rider that periodical examination of mains should be made. Evidence pointed to the escape from a main of gas which had percolated into the house.

Loss on the Denton Gas Undertaking.—The gas undertaking of the Denton Urban District Council is said to be in a serious state. There is an overdraft at the bank of £9000, and the price of gas has risen at one bound from 3s. 9d. to 4s. 9d. per 1000 c.ft. The Coal Controller is blamed for much of the loss; but the Council have made changes in the department, in the hope that the rapid decline will be arrested. Two years ago the gas department was holding its own, if not making a profit.

Reduced Gas Sales at Altrincham.—The accounts of the Altrincham Gas Company for the past year show a profit on revenue account of £12,020; and there is a balance at profit and loss account available for dividend of £9307. This is sufficient to provide for the payment of the full statutory dividends, and leave a balance of £6384 to be carried forward. Compared with the year 1917, there has been a decrease in the sales of gas of 12½ million c.ft., brought about by the terms of the Household Fuel and Lighting Order.

Sales Maintained at Redhill.—Notwithstanding the operation of the Household Fuel and Lighting Order, and other Government restrictions in force during the year, the sale of gas in 1918 by the Redhill Gas Company fell short of that recorded in the previous year by less than 1 p.ct. The raising of the price of gas 4d. per 1000 c.ft. reduced the statutory rates of dividend payable on the shares and ordinary "B" stock respectively to 8 and 4 p.ct.; but after these have been distributed there will be a balance to be carried forward of £1137.

Welsbach Company's Excess Profits.—The Welsbach Light Company announce that, after numerous conferences with the Inland Revenue Authorities, the principle upon which the standard for excess profits duty purposes should be calculated has been settled. For the year ended March 31, 1917, the duty (based on a standard of £24,766) has been fixed at £10,160, as against £18,207 provided for in the accounts. The actual figures for the year ended March, 1918, have not yet been adjusted; but it is anticipated that the standard for this period will amount to somewhat over £30,000.

Supply of Gas and Electricity at Farnham.—On Monday of last week there was held the ninth ordinary meeting of the Farnham Gas and Electricity Company, when the Directors submitted the accounts for the year 1918. The total receipts on revenue account were £23,446, as against £22,358 in the previous year; and the payments amounted to £19,848, compared with £18,129. The gas brought to charge was 64,396,700 c.ft.; while in 1917 it was 67,041,600 c.ft. The Directors recommended the payment of a dividend at the rate of £4 18s. p.ct., less income-tax, for the year (the amount permissible under the sliding-scale), leaving a balance of £103 to be carried forward.

USE Simmance's

DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne; Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

Wakefield Gaslight Company.

In moving the adoption of the report and the accounts for the year 1918, at the annual meeting of the Company on the 17th ult., the Chairman (Alderman G. A. Moorhouse, J.P.) referred to the serious position with respect to coal, which had cost £2367 more than the previous year, with 212 tons less carbonized. There had also been great difficulty in obtaining it, as a number of their contracts for coal had been, and were still being, diverted to other works, with the result that their stocks were very seriously depleted. Wages showed a very large increase; all the advances being in accordance with the awards of the Committee on Production. The additional cost of coal and labour in all other industries had also had the effect of advancing the price of all tools, machinery, pipes, meters, and other articles used in the manufacture and distribution of gas, with the inevitable result that it had been necessary to advance the price of their own commodity. There had been a decrease in the sale of gas of over 10 million c.ft. due almost entirely to the Fuel and Lighting Order. The dividend was reduced on the ordinary stock to 3¾ p.ct. under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, compared with 6½ p.ct. before the war. This was very harsh treatment by Parliament, after all they had done to help the country to win the war. The usual votes of thanks to the Directors, officers, and staff closed the proceedings.

Belfast Gas Supply.—The Belfast shipbuilders' and engineers' strike having collapsed (the men returning to work on a 47-hour basis), and the municipal services being resumed, the gas-works are again in full swing, and all is proceeding satisfactorily.

Barcelona without Light.—A message through Reuter's Agency says that, owing to the general strike of the employees of the Company who supply Barcelona with electricity, gas, and water, all the tramway services and the supplies of water, gas, and electricity have been stopped; and the town is in complete darkness.

Scarborough Gas Company.—Presiding at the annual meeting of the Scarborough Gas Company, Mr. W. S. Rowntree said the sale of gas showed the satisfactory increase of 11 p.ct., as has already been recorded in the "JOURNAL" [*ante*, p. 279]. The year's working, after providing for dividends, left a balance of £2809, which was carried forward, in order to meet the cost of essential renewals in the manufacturing plant, which could not be undertaken during the war. There was every indication that the coming season would be a record one for Scarborough; and a prosperous year would bring nearer the possibility of a reduction in charges. The necessity for raising meter-rents having been questioned, he explained that the amount received from these was intended to provide for interest on capital outlay and the costs of repairs and renewals, which were now more than double pre-war rates. Appreciation was expressed of the efforts of the staff; it being remarked that the Engineer (Mr. A. P. Allan) possessed great and unique qualifications for his position.

Increased Cost and Decreased Sale at Exeter.

Mr. G. Hardy Harris presided at the annual meeting of the Exeter Gas Company yesterday week, when it was reported that the effect of the economy exercised by consumers was a decrease in the sale of gas last year of 8 million c.ft., or 1·85 p.ct. Owing to the advance in the price of coal, materials, and labour, the price of gas was advanced 6d. per 1000 c.ft. during the year. The Chairman remarked that, not only had they suffered by the extra cost of coal, which was 18½ p.ct. over the previous year, but by the bad quality. Wages represented a sum equal to 25 p.ct. of the Company's total revenue, and three-and-a-half times as much as was paid out in dividends. In this cost, the increase was 44 p.ct., or £7745 more than in 1917. The increase in the price of gas was equal to 14 p.ct. Besides the advance in the cost of coal and labour, many articles had gone up roughly by 100 p.ct. Since the war began, wages had increased by 105 p.ct., and coal 80 p.ct.; while allowing for the loss through the bad quality of coal supplied, the increase in the cost would be 110 or 120 p.ct. The increase in the price of gas had been 50 p.ct. Although they had been working to meet the requirements of the Ministry of Munitions, they had been able to maintain practically the standard quality of the gas; and the supply had been sufficient. The profits on the year's trading were £11,267; and after paying income-tax (£4604), debenture interest, and dividends, there would be £88 to place to the reserve fund. As to the future, if wages and the cost of coal continued to advance, the price of gas would have to be increased again. The average dividend paid by the Company was only 6·05 p.ct. on the capital. The report was adopted, and the usual dividends declared.

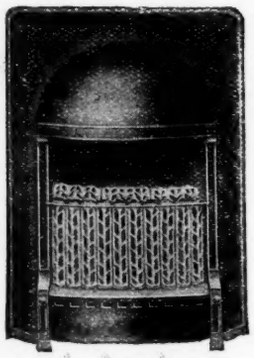
Investigating a Gas Escape with a Light.—Sergeant-Major Pepper, of Burton-on-Trent, was last week so injured in a gas explosion as to require treatment in the infirmary. He noticed a smell of gas in the house; but, not thinking the escape serious, he struck a match. There was immediately an explosion, which damaged the house and shattered the windows of adjoining houses. When Pepper was rescued he was badly burnt.

A Disappointing Profit Balance at Aberystwyth.—In submitting the statement of accounts for the half year ended Dec. 31, the Directors of the Aberystwyth Gas Company express their regret to the shareholders that the balance of profit shown—£698—is again disappointing. It has been found practically impossible to adequately provide against the adverse conditions of the present time; for estimates based upon the costs of labour and material one month are falsified by the prices ruling a month later. And so it happens, they say, that an advance of 10d. per 1000 c.ft. in the price of gas has proved to be inadequate to provide the modest 5 p.ct. anticipated, on the share capital of the Company, and that to pay a dividend at this rate, which the Directors recommend (a fall of 7¾ p.ct. since December, 1917), will necessitate the withdrawal of £120 from the profit and loss account.

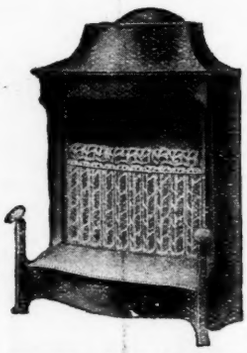
WRIGHT'S "THERMO-X" GAS GRATES

STILL RETAIN ALL THE OUTSTANDING ADVANTAGES THAT FOR MANY YEARS HAVE MADE THEM PRE-EMINENT AND PREFERRED.

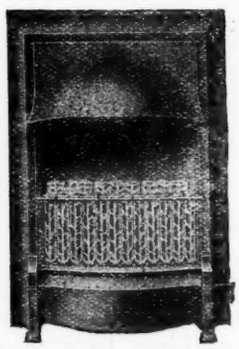
They warm and ventilate a room quite as efficiently as the best coal fire.



WRIGHT'S "TALISMAN" SERIES
with "Thermo-X" Firefront and "Injector Ventilator."



WRIGHT'S "AERO" SERIES
with "Thermo-X" Firefront and "Injector Ventilator."



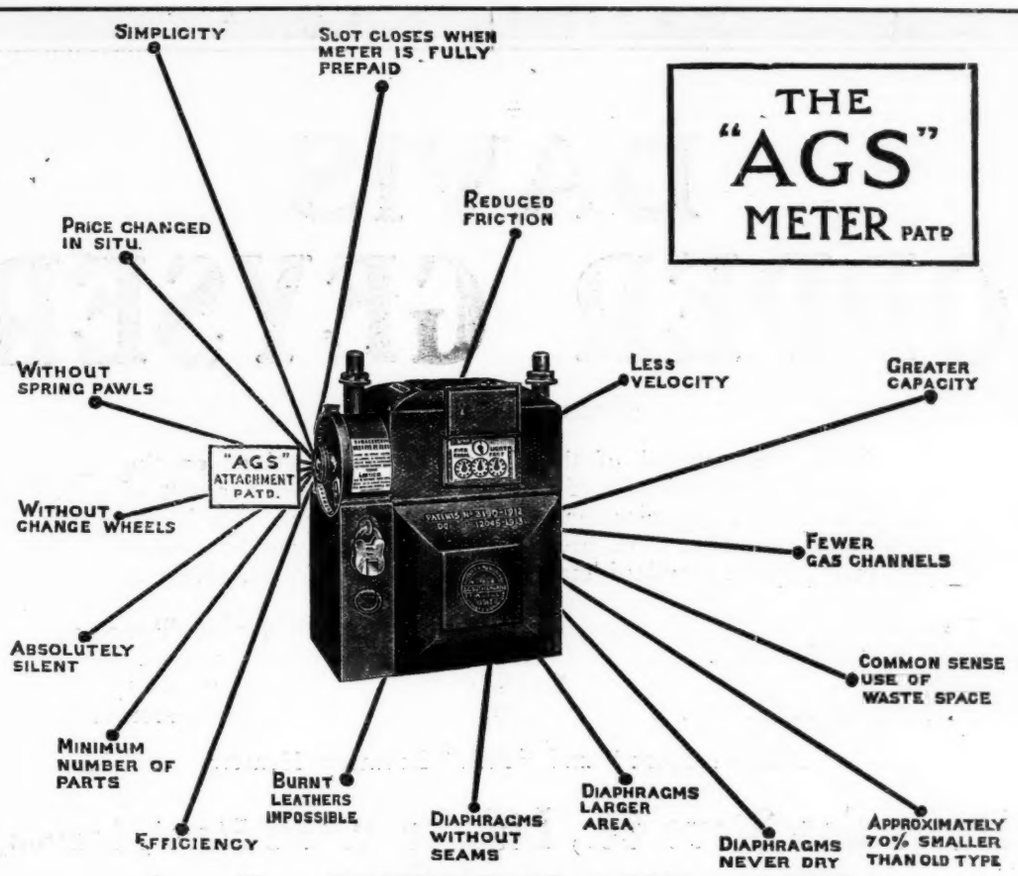
WRIGHT'S "SWASTIKA" SERIES
with "Thermo-X" Firefront and "Injector Ventilator."

THE ABOVE ILLUSTRATIONS REPRESENT A LARGE VARIETY OF OUR GAS-GRATES, PARTICULARLY SUITABLE FOR USE IN CONNECTION WITH HOUSING SCHEMES. :: :: WE SHALL BE PLEASED TO SEND COMPLETE LISTS ON REQUEST. :: ::

JOHN WRIGHT & CO.,

Essex Works, Aston • BIRMINGHAM.

LONDON SHOWROOM: 19-21, Queen Victoria Street, E.C. 4.

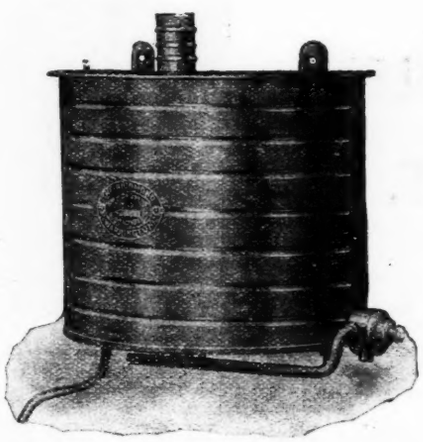


A. G. SUTHERLAND, LTD.,

Works: WARWICK ROAD, GREET, BIRMINGHAM.

The Housing Scheme

Hot Water Supply.



Richmond's "Lyn" Boiler.

An ideal apparatus for new houses, specially suitable for fitting over wash-up sinks or lavatory basin where a moderate supply of hot water is required for general domestic use. Patent thermostat reduces gas when water is hot and raises gas when water is drawn off. No attention is required, the boiler is always full of water, it is only necessary to turn on the water tap, every other working part is automatic. Constructed of stout copper and supplied in four sizes of from 2 to 6 gallons capacity.

We place our services at your disposal to do all possible in the interests of Gas service for new Estates in your district.

THE RICHMOND GAS STOVE & METER Co. Ltd.

General Offices: **Academy Street, Warrington.**
Offices & Showrooms: **132, Queen Victoria St., London, E.C. 4.**
Glasgow Offices: **Lion Chambers, 170, Hope Street.**

DAVIS COPPER GEYSERS

(Prompt Deliveries)

With the removal of the Government restrictions on the manufacture and sale of Copper Goods, and as a result of the entire reorganization of their Geyser Dept., THE DAVIS GAS STOVE CO., LTD., are able to give prompt deliveries of their popular standard lines of Instantaneous Water Heaters.

Closed Types:
"PERFECTA" (*High Grade*).
"SHAMROCK."
"CASCADE" SHOWER GEYSER.

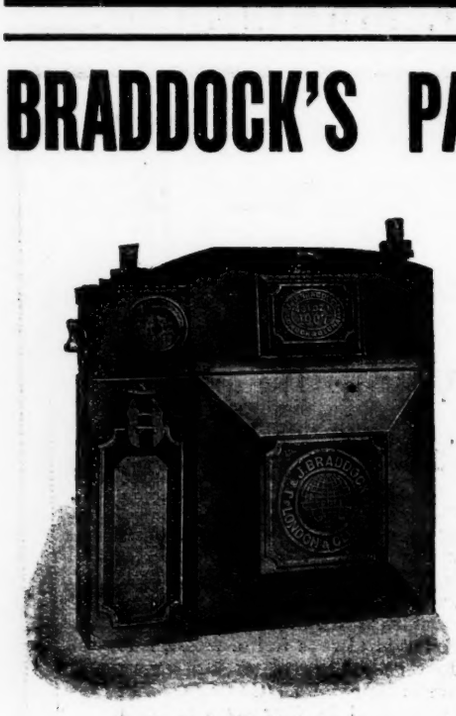
Write for **Davis Geyser List.**

Open Types:
"NIAGARA" (*High Grade*).
"THISTLE."
"PRIORITY" (*Cast Iron*).

Also "MIDGET" *and* "F.B." Lavatory Heaters.

The Davis Gas Stove Co., Ltd., 60, Oxford Street, London, W.1.

BRADDOCK'S PATENT "SLOT" METERS.



No. 261. Dry "Slot" Meter.

THE BEST SLOTS MADE.

No. 265. Wet "Slot" Meter.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, **OLDHAM.**

Telegrams—"BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.

Telegrams—"METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

Refusing to Work in a Purifier-House.

An interesting case to gas companies came before the Sheffield Munitions Court last Thursday, when two labourers, named Richard Hardy and Henry Hepplestone, sued the Sheffield Gas Company for compensation for their dismissal without notice or wages in lieu of notice. The Company's plea was that the men refused to work in the purifier-house. Hardy said he found the work too hard for him. Hepplestone said he had not tried the work. He thought it would be injurious to his health, as he suffered from rheumatism in the head. Mr. J. Johnson, representing the Company, said the general labourers objected to work in the purifier-house, despite the fact that they received 2s. per week extra for doing so. The conditions, he asserted, were actually beneficial to health. Women and children suffering from chest complaints and whooping cough were taken down to the gas-works, and were allowed to sit in the purifier-house while the boxes were opened. There was a septuagenarian at Neepsend who was still working in the purifier-house. The Chairman (Mr. E. W. Clegg) allowed Hardy's claim for £2 16s. 9d. compensation and 5s. costs; the man's physical condition being such that he was justified in refusing to do the work. He dismissed Hepplestone's claim, as he refused the work without giving it a trial.

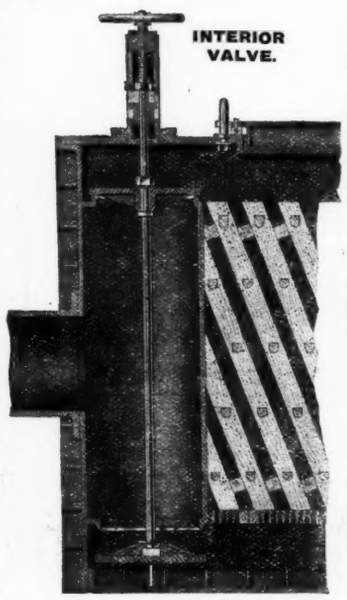
Normanton Gas Company.—At the half-yearly meeting of the Normanton Gas Company—Mr. G. M. Lawrence presiding—the report showed that the profits amounted to £1821; and the amount available for division was £3607. Out of this, dividends of 5½ p.ct. on the original stock and 4 p.ct. on the additional stock were recommended. The Chairman said improved conditions had enabled the Company to carry on with an advance in the price of gas of under 40 p.ct. compared with pre-war rates. The report was approved, and the dividends recommended were declared.

South Staffordshire Mond Gas Company.—Mr. Robert R. L. Mond presided at the annual meeting of the shareholders last Tuesday, at Dudley Port. He stated that, despite the fact that a Bill for extending the plant was brought in at the request of, and by arrangement with, the Ministry of Munitions, the Government refused to allow the Company to make use of it, and had compelled them to pay the whole cost of its promotion. Until the armistice was signed, they were unable to meet the requirements of customers; but since then, the demand had fallen off slightly, and they were meeting requirements. Research work with regard to the better utilization of their residuals had had encouraging results, and the Directors had ordered plant to deal with the tar as the first instalment. This should be at work by the early summer. Owing to sulphate of ammonia being controlled, and having to be sold at fixed prices out of all proportion to the increased cost of manufacture, the net revenue from this item was several thousands of pounds less than it ought to have been. Application would shortly be made to the Board of Trade to allow the Company again to increase their prices of gas. He had no doubt it would be granted.

Leicester Corporation Gas-Fitters.

The Court of Arbitration have given their award in the case of the wages of the Leicester Corporation gas-fitters. The parties to the reference were the Corporation Gas Department and the National Union of Operative Heating and Domestic Engineers. The claim submitted was for a substituted rate—*i.e.*, that the gas-fitters (members of the Union) employed by the Gas Department should receive the advance given under the award (No. 2800) of the Committee on Production, dated Nov. 9, 1918 (Engineering and Foundry Trades). Representatives of the parties were heard on Feb. 14. The pre-war rate of the men concerned was £2 0s. 6d. a week; and they have received advances amounting to 23s. 6d. a week *plus* the bonus of 12½ p.ct. on earnings. The award of the Court is in the following terms: (5) The men concerned, aged 18 years and over, shall receive an advance of 5s a week, and boys, youths, and apprentices under 18 years of age shall receive an advance of 2s. 6d. a week. (6) The amounts hereby awarded are to be taken into account in the calculation of payment for overtime and night duty and for work on Sundays and holidays (where extra payment is made for such work). (7) The rate in force on Nov. 11, 1918, as modified by the advance provided for in Clause 5 hereof, shall be, and shall be deemed to be, the substituted rate of wages for the purposes of the Wages (Temporary Regulation) Act, 1918. (8) The award shall take effect as from the beginning of the first full day following Feb. 20, 1919.

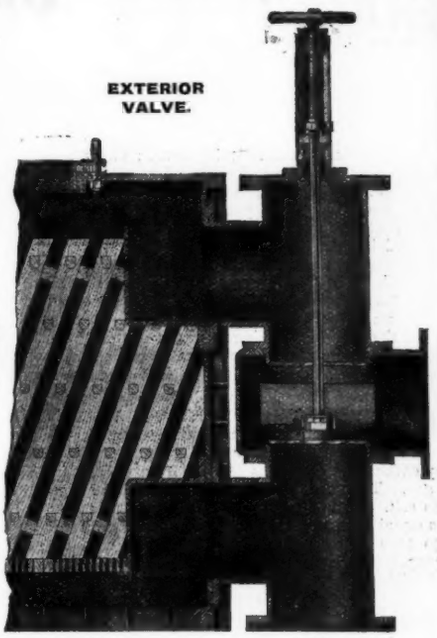
Grays and Tilbury Gas Company.—The half-yearly meeting of this Company was held at No. 4, Eastcheap, London, E.C., on the 24th ult., when dividends at the rate of 7½ p.ct. per annum on the "A" shares and 5¼ p.ct. per annum on the "B" shares were declared. Lieut.-Col. F. E. Bartlett, in moving the adoption of the report and accounts, said the gross revenue was £278 more than for the corresponding period of 1917; but, although 716 tons of coal less were used in carbonizing, the costs were slightly higher. Wages at the works were considerably higher; likewise all repairs, especially meters and stoves, owing to the higher costs of all materials and labour. A sum of £430 had been credited to the capital expenditure account for depreciation of gasholders, meters, and stoves. A further sum of £500 had been written-off the suspense account; and £500 had also been placed to the credit of the renewal fund. Sales of gas showed an increase of £2706, partly due to the increase in price and partly to increased sales; while residuals showed a decrease of £992, due to less coal being carbonized. Sales of gas showed an increase of 3·2 p.ct., compared with the corresponding period of 1917. Included in the expenses was a sum of £115 paid to the dependants of workmen serving in His Majesty's Forces. In responding to the vote of thanks to the Directors and staff, the Deputy-Chairman (Mr. Courtenay C. S. Fooks) referred to the able and efficient manner in which the Engineer (Mr. A. W. Sumner) and the Secretary (Mr. W. F. Whittaker) and their staffs had discharged their respective duties.



YOU CAN CHANGE THE FLOW OF GAS IN ANY PURIFIER BY THE USE OF OUR

UNIT REVERSING VALVE.

CAN BE OPERATED FROM THE SIDE OR TOP.



R. & J. DEMPSTER, LTD. MANCHESTER.

TELEPHONES: CENTRAL 54 AND 2296. LONDON OFFICE— VICTORIA 7426.

Temporary London Office: BLENHEIM MANSIONS, BROADWAY, WESTMINSTER, S.W. 1.

Wages at Burnley.—At a meeting of the Burnley Corporation War Wages Committee, the application of the gas workers was read for advances on time and piece rates; and it was decided to send a resolution to the London conference on the matter, protesting against any further advance of war wages being given to employees of gas undertakings, and that, as regards Burnley, the maximum price that can be charged by Statute for gas will not enable the Gas Committee to pay any further increase in wages without the undertaking becoming a charge upon the rates.

Canterbury Gas Undertaking.—After payment of interest on the loan capital for the year 1918, there is standing to the credit of the uniform dividend account of the Canterbury Gas and Water Company the sum of £4859; and at the annual meeting the statutory dividend of 6¾ p.ct., less income-tax, was declared. There was a decrease in the sale of gas for the year of 15,987,700 c.ft. as compared with the preceding twelve months. Increased cost of coal and wages necessitated an advance in the price of gas of 6d. per 1000 c.ft., as from the reading of the meters for the June quarter, making it 4s. 3d.

Electricity Developments at Manchester.—At the annual meeting of the Manchester Ship Canal Company last Thursday, Mr. W. C. Bacon, the Chairman, stated that the Manchester Corporation had acquired a site at Barton, adjoining the Ship Canal and Bridgewater Canal, for the erection of a large generating station there. Negotiations were also in progress for the establishment of a station close to the Ship Canal at Runcorn, where the provision of cheap electricity would be a great benefit to all the district, and, incidentally, should assist the development of industries on the banks of the Canal.

Weston-super-Mare Gas Company.—The Directors recommended at the meeting last Friday the payment of the maximum dividend of 5 p.ct., less income-tax, on the ordinary stock for the past half year. Owing, however, to the enormous increase in the cost of labour and materials, the result of the year's working shows an adverse balance on the profit and loss account amounting to £1355, to which has to be added £2181 for the dividend for the past six months. The necessary sum to meet these charges will be transferred from the reserve fund. Sales of gas show a decrease on those of 1917 of less than 1 p.ct.

Coal Supplies and Gas Production.—The gravity of the coal situation and the extent to which it will be aggravated in the event of a miners' strike were discussed in a statement made by Alderman Kay, the Chairman of the Manchester Corporation Gas Department, last Saturday. The immediate effect of a strike, he said, would be absolutely fatal to them. Some of the coal they were carbonizing to-day had been in stock for more than thirty years; but while they had a reserve stock of 60,000 tons at this time last year, the quantity in reserve now was not equal to more than three days' needs. The treatment of gas undertakings by the Coal Controller had been absolutely inimical to the best interests of consumers, ratepayers, and everybody concerned. They were compelled at the present time to take Durham coal when in the normal course they should obtain supplies from Lancashire and Yorkshire collieries in the near neighbourhood. An additional expenditure of 8s. or 10s. per ton was consequently entailed. A strike would find the Electricity Department in a worse plight, because, while the Gas Department always had a day's store of gas in hand, there was no store of electricity.

Rome Gas Company.—The group of shareholders in Paris formed for the protection of British and French shareholders in the above Company have sent out a circular which states, *inter alia*, that the difficulties in connection with the gas undertaking have now been overcome. In 1916, owing to the increased prices of coal, wages, and raw materials, there was a loss of3,337,000 lire. In 1917, however, the position was materially improved; and after allowing for the loss on the manufacture and sale of gas, there remained a profit of 1,873,956 lire. As regards the year 1918, the arrangements made with the Italian Government produced good results, and not only have the profits derived from the manufacture and the sale of electricity not been absorbed by losses in connection with gas, but the latter branch has itself resulted in a profit to the Company. Consequently, the report to be submitted at the next general meeting (on March 27) will show a satisfactory state of affairs, and the Directors will be in a position to declare a dividend. The group of shareholders acting under the initiative of the Société des Compteurs et Matériel d'Usines à Gaz and the Crédit Commercial de France has served a very useful purpose during the difficult period through which the Company have passed.

Chichester Gas Company.—Presiding at the half-yearly meeting of proprietors last Tuesday, Mr. W. A. Walker, the Chairman of the Company, illustrating the necessity for an increase in the price of gas, said that in the December half year preceding the outbreak of war they carbonized 2490 tons of coal, from which they sold 27,597,000 c.ft. of gas. This coal cost £2660, which was equal to 1s. 11·13d. per 1000 c.ft. of gas sold. Carbonizing wages amounted to £378, which was equal to 3·20d. For the half year just closed, they had carbonized 2290 tons of coal—and sold 25,502,000 c.ft. of gas. The coal cost £4015, equal to 3s. 1·78d. per 1000 c.ft. sold; and the wages paid for carbonizing amounted to £609, or 5·72d. per 1000 c.ft.—an increase in the coal of 1s. 2¾d. per 1000 c.ft., and in the wages of 2¾d., or a total of 1s. 5½d. The advance in the cost of all other materials and forms of labour had kept pace with these quoted examples. Examining the accounts of the Company for the past half year, he said the expenditure in the aggregate amounted to £7527, in comparison with £6893 for the same period of 1917; showing an increase of £634. In the sale of gas, there had been an increase of £704, and in rentals of £122; but the sale of residual products had shown a reduction of £66, chiefly attributable to the difficulties of dealing with ammonia. The gross receipts amounted to £8934, compared with £8173 twelve months ago—an increase of £761. The balance to the credit of the revenue account was £1406, in comparison with £1280, or an increase of £126, which just enabled them to recommend the dividends payable under the new Order. There had been a decrease in the output of gas for the half year of 2·11 p.ct. The dividends recommended were ordered to be paid.

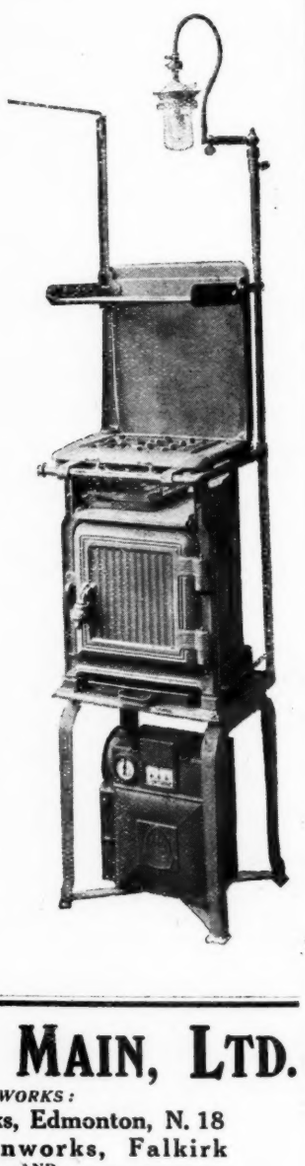
A Complete

Slot Installation

THE MAIN COMBINATION

Comprising:

Prepayment Meter.
Cooker on Stand.
Plate Rack and Enamelled Backplate.
Towel Rail.
Inverted Incandescent Burner, and Connection for Extensions.



Specially designed for Workmen's Dwellings, Flats, Bungalows, and Houses for more than one tenant.

COMPACT AND COMPREHENSIVE.

Economises Space, Piping, and Labour in Fitting.

R. & A. MAIN, LTD.

WORKS:
Gothic Works, Edmonton, N. 18
Gothic Ironworks, Falkirk
AND
Gothic Works, Birmingham

Showrooms & Branches:
25, PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Allocation of Gas Profits at Birmingham.—The Birmingham Gas Committee recommend to the Council the allocation of £15,000 from profits of the undertaking to the relief of the rates for the ensuing year. This is substantially less than in previous years, and is attributed by Sir Hallewell Rogers, M.P., the Chairman, to the greatly increased administrative charges, particularly in relation to wages. Alderman Williams, the Chairman of the Finance Committee, declares that the time has arrived when the trading Committees of the Corporation will have to consider the advisability of again revising the charges for their respective services to the public.

Gassing Accident.—Over thirty cotton operatives at the Bell Mill, Oldham, were last Wednesday morning affected by an escape of gas at the mill; and two of the workmen—Thomas Ashworth and Harry Taylor—were so seriously gassed that they had to be taken to the infirmary. Ashworth was detained in a serious condition, and Taylor was removed home after treatment. It is surmised that an operative carrying a skip accidentally caught the chain which turned on the main tap of the gas supply in the second spinning room, and the escaped gas ascended to the floor above, affecting also the operatives in the first spinning room, where Ashworth and Taylor were at work.

Cost of Reinstating the Public Lighting of Manchester Streets.—The Gas Committee of the Manchester Corporation have presented a supplementary estimate for £5000, the cost of bringing the street-lamps into efficient order, and the provision of extra gas and maintenance consequent on the withdrawal of public lighting restrictions.

Wellington (Salop) Gas Company.—Mr. C. W. Leake (the Chairman) presided at the annual meeting, when the Directors reported a surplus of £2559, and it was decided to pay a dividend making 5⅜ p.ct., less income-tax, for the year. Over the past two years, the price of gas had remained at the low figure of 3s. 6d. per 1000 c.ft.; but any further burdens would render inevitable a serious increase, with a consequent reduction of dividend under the sliding-scale. The Chairman said that in 1913 coal cost 16s. per ton; and it was now from 28s. to 33s. He called attention to the excellent services rendered by the Manager (Mr. H. J. Woodfine), and said good working results had enabled them to realize an increased amount for residuals of over £500. The advance in the price of gas for lighting purposes since the outbreak of the war had been only 16½ p.ct. The Vice-Chairman (Mr. R. J. Milbourne) seconded the adoption of the report, which was agreed to.

STOCK MARKET REPORT.

THE course of events on the Stock Exchange last week, similarly to the week before, had its variations in tone, and these, mainly if not wholly, were actuated by the same factors. The opening day was apprehensive in regard to the labour position, and dulness was the consequence. But some relief was apparent the next day, and by Wednesday decidedly more hopeful expectations of some reasonable arrangement with the miners being reached were entertained. Thenceforward nothing occurred to dash these hopes, and the week closed fair.

In the gilt-edged market, Home Government issues maintained a good front and rather improved their position. War Loans were firm, and on Friday the 5 p.ct. was done repeatedly at 95½. Some demand appeared for Consols, which closed at 59¼. Indians, after a poor start, advanced. Home Rails had a good week on the whole, but did not close quite at their best. Canadians continued weak, and Argentines were irregular.

In the Foreign Market, the weakness of French Loans was the leading feature, and the cause of their condition is not exactly clear. Russians were quite out of favour. On the other hand, Mexicans, Brazilians, Japanese, and China were firm. The Miscellaneous department was not very lively. Rubbers were in better request; but Oils had a weak fit.

Business in the Gas Market was a good deal quieter; the aggregate of bargains marked showing a great falling-off. The tendency on the whole was very fair, but had its ups and downs. In the Metropolitan group, Gas Light and Coke and South Metropolitan lost a point on their ordinary and gained one on their preference. Commercials were quoted *ex div.* at advanced figures. In Suburbans and Provincials, South Suburban and Tottenham had advances, and Bournemouth and Portsea were firm. In Continentals, European changed hands at higher figures; but Imperial Continental was rather easier, though the quotation was left unchanged.

Bargains done for cash during the week were as follows: On Monday, Bombay 6½, British 32, Commercial 4 p.ct. 65, 65½, 65⅝, Gas Light ordinary 65, 65½, 66, ditto maximum 56½, ditto preference 70, Imperial Continental 119½, 120, Primitiva 35s., South Metropolitan 70½, 71½, South Suburban debenture 90½, 91. On Tuesday, Alliance and Dublin 50 5/16, Buenos Aires 52¾, 53, Commercial 3¼ p.ct. 60½, 60⅞, 61, European 13⅛, Gas Light ordinary 65, 65⅛, ditto preference 69½, Imperial Continental 118⅞, 119, 119⅛, Primitiva 37s. 6d., ditto preference 57s. 6d., 60s., South Suburban debenture 90, Tottenham "B" 67½, Worsborough Dale 10 p.ct. "A" 79s. 8½d. On Wednesday, European 13¼, Gas Light ordinary 64½, 65, ditto preference 70, Imperial Continental 119½, Primitiva preference 55s., Tottenham "B" 66, 66½, 66¾, Wandsworth new ordinary 70, Southgate 141½, 142. On Thursday, European 13, Gas Light ordinary 64, 64¼, 64½, 65, ditto preference 70, Imperial Continental 118¼, 119, Oriental 104½, 105, Primitiva preference 55s., South Suburban 80, 80½, Tottenham "B" 68½. On Friday, Brentford debenture 65, British 32, Gas Light ordinary 66, ditto preference 70⅞, 71½, Imperial Continental 117⅞, 118½, 118⅞, 119½, Primitiva 35s., South Metropolitan 69.

In the Money Market, business continued to be as in the week before, alternating between a sharp and extreme ease according to the supply. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,551,868	,,	April 8	2½	4⅜%	Alliance & Dublin Ord.	59—64	48—50	50 5/16
374,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
230,000	5	April 29	7½	8%	Bombay, Ltd.	5⅞—6⅛	5⅞—6⅛	6½
50,000	10	Feb. 26	16	12⅝	Bournemouth Gas and Water { 10 p.c.	29—30	21—23*	..
883,110	10	,,	7	7%	B 7 p.c.	15—15½	10—11*	..
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9—9½*	..
159,740	—	—	—	4%	4 p.c. Deb.	..	66—68	..
992,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261—266	76—79	..
784,920	,,	,,	11	31/8	Do. B New	204—209	70—75	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	75—80	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	63—65	65
217,880	,,	Feb. 26	11	8½%	Brighton & Hove Orig.	208—213	140—145	..
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	97—102	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
630,000	20	Mar. 26	12½	22/6	British	44—45	31½—32½	32
130,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	52½—53
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3½—4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7½—8½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,513,380	,,	Feb. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	62—65*	65—65⅞
660,000	,,	,,	5½	26/8	Do. 3½ p.c. do.	103—105	59—62*	60½—61
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	48—53	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	70—75	..
51,500	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155—165*	..
278,400	—	,,	11½	9½%	Croydon B and C 7 p.c.	..	130—135*	..
492,370	Stk.	—	8	6½%	Derby Con. Stk.	128—135	..	..
55,000	,,	,,	4	4%	Do. Deb. Stk.	102—104	..	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	12½—13½	13—13½
16,398,975	Stk.	Feb. 10	4/17/4	80/-	Gas Light and Coke { 4 p.c. Ord.	98—102	64—66	64—66
2,600,000	,,	,,	3½	26 8	3½ p.c. max.	76—79	55—57	56½
4,062,395	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	70—72	69½—71½
4,674,350	,,	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	56—59	..
180,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
82,500	,,	Mar. 12	5	4½%	Hastings & St. L. 5 p.c.	..	60—65	..
358,740	,,	—	3½	2½%	Do. 3½ p.c.	87—89	45—50	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16¾	7⅝—8⅛	..
86,600	Stk.	Sept. 12	9	9%	Hornsey 7 p.c.	..	117—122	..
131,000	,,	Mar. 12	7½	5⅜%	Ilford A and C.	151—154	92—97	..
65,780	,,	,,	6⅜	4½%	Do. B	115—118	70—75	..
66,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	62—65	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	117—122	117½—119½
1,235,000	,,	Feb. 12	8½	3½%	Do. 8½ p.c. Deb. Red.	84—86	72—74	..
295,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	93—98	..
2,498,905	,,	Feb. 26	10	42/6	Liverpool 5 p.c. Ord.	211—213 / 146—148	..	..
806,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	,,	Aug. 15	4½	3⅜%	Maidstone 5 p.c.	..	60—65	..
75,000	5	June 11	6	8%	Malta & Mediterranean	4½—4⅝	8½—8¾	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	98—101	90—97	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	9⅜—9⅞	..
1,875,892	Stk.	July 29	4½	5½%	Newcastle&Gatsh'd Con.	98½—99½	70½—71½*	..
529,795	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—88	57—59	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	103—105	104½—105
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	4⅝—5½	..
60,000	50	Feb. 26	18	7½%	Porisea, Island B	128—131	76—81*	..
100,000	50	,,	12	6½%	Do. C	118—121	58—63*	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	1⅞—2⅛	35/—37/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4⅛—5	2⅜—3⅛	55/—60/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	74—76	..
600,000	Stk.	July 31	4	4%	Do. ,, ,, 1911	..	46—49	..
346,198	,,	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	48—52	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7⅜—8½	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	238—234	85—87	..
209,984	,,	,,	10	5%	Do. B	229—234	85—87	..
528,500	,,	,,	10	5%	Do. C	230—232	84—86	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	13—14	..
6,609,895	Stk.	Feb. 10	5/4/0	80/-	South Met. 4 p.c. Ord.	111—113	69—71	69—71½
250,000	,,	July 12	—	5%	Do. Pref.	..	95—97	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	..
224,820	,,	Feb. 26	3½	5%	South Shields Con. Stk.	167—169	112—114	..
952,795	,,	,,	6	3⅜%	S'th Suburb'n Ord. 5 p.c.	114—116	76—79*	80—80½
197,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	89—92	90—91
647,740	,,	May 14	3	3%	Southampton Ord.	99—102	67—70	..
120,000	,,	Feb. 12	7½	5⅜%	Tottenham { A 5 p.c.	135—138	90—95*	..
782,275	,,	,,	6	4⅜%	District { B 3½ p.c.	115—117	65—67*	66—68½
181,355	,,	June 26	4	4%	4 p.c. Deb.	87—89	64—66	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,478	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109	87—88	..
80,000	,,	Feb. 26	3⅜	55/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	92—93*	..
255,636	,,	,,	6¼	40/-	Do. B 3½ p.c.	129—134	68—73*	..
108,075	,,	,,	—	38/6	Do. C	..	68—73*	..
140,865	,,	,,	—	38/6	New Ordinary	..	68—73*	70
352,000	,,	,,	6¼	38/9	Wimbledon 5 p.c.	117—122	63—73*	..
98,000	,,	,,	6¼	40/-	Epsom 5 p.c.	121—126	70—75*	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	68—69	50—52	..

* *Ex div.*

Irish Lighting Restrictions.—A new Lighting Order was issued last Friday by the Irish Lords Justices (in the absence of Viscount French, the Viceroy) allowing all premises to be open for the transaction of business until 8.30 p.m.—thus revoking the provision for closing in the late afternoon and early evening, in order to save gas and electric current owing to the shortage of coal. Theatres, picture houses, and amusement halls must close at 10.30 p.m.

Price of Electricity at Manchester.—At the next meeting of the Manchester City Council, a recommendation of the Electricity Committee of the Corporation to sanction increased charges for electricity and motor hire will come up for consideration. The proposals provide for a 40 to 60 p.ct. increase on lighting (including domestic power), 50 to 85 p.ct. on industrial power, and 20 to 30 p.ct. on special large power consumers, governed by contracts containing sliding-scale coal charges.

Tarred Roads and River Pollution.—A national conference of Fishery Boards was held at the Town Hall, Manchester, last Wednesday, when the question of river pollution came in for discussion. Mr. H. Joliffe said that, so far as the River Dee was concerned, their greatest difficulty was with the road tar, which washed into the river and choked the salmon. A resolution was unanimously passed that the existing laws regarding river and estuarial pollution must be so amended as to give full power to deal with the question of pollution.

Strike of Brassworkers at the Granton Gas-Works.—At a meeting on Monday of last week, the Edinburgh and Leith Gas Commissioners had before them a report by their Engineer and Manager (Mr. Alexander Masterton) concerning a strike of brassworkers at the Granton Gas-Works. It appears that on Jan. 29 the general foreman was informed by the brassworkers that they had been ordered to join the strikers. He drew their attention to the Conspiracy and Protection of Property Act, 1875; but, notwithstanding this, they left the works at the usual time, and failed to put in an appearance next morning. It was further reported that a letter had since been received from the Brassfounders' Association, stating that it had been resolved to withdraw from the strike; and the men intended to resume work on the 11th ult. The Association asked that the men in question should be allowed to return to work accordingly, as they had nothing to do with the situation, and had gone out against their own wishes. Mr. Masterton was instructed to reply that the men could return on Feb. 17, but that any further strike of the kind would be more seriously dealt with.

Tunbridge Wells Gas Company.—The sale of gas for the past year at Tunbridge Wells shows a decrease of 6¾ p.ct. when compared with the quantity sold during the year 1917; the falling off arising from the time of coming into force of the restrictions relating to the supply of gas. In the report presented at the annual meeting of the Company last Friday, the Directors stated that, in accordance with the authority of the proprietors at the last annual general meeting, payment of an interim dividend of 10¾, 8¼, and 7¾ p.ct. per annum on the consolidated ordinary, "B," "C," and "D" stocks (less income-tax) was made for the half year ended June 30. The accounts for the year show that, after providing for all fixed charges, there is an available balance of £10,886, out of which the Directors recommended a dividend for the half year, to Dec. 31, at the same rates, which will absorb £3610 (after deduction of income-tax), and leave £7275 to be carried forward. The further increase in the cost of coal, wages, and materials has imposed a heavy burden upon the working of the Company, making it necessary to raise the price of gas 6d. per 1000 c.ft. from Christmas last; the present price being 3s. 9d. The total wages and salaries paid by the Company in 1918, with a reduced number of employees, amounted to £16,067 (the last increase only dating from Oct. 1; whereas in the year 1914 the wages and salaries amounted to £12,187.

Considerable damage was done on Friday morning to a house in Drogheda, by an explosion of gas, which had escaped and accumulated, it is believed, through the breaking of a gas-main by a steam-roller in use in the thoroughfare.

The Lighting Committee of the Leyton Council report that they have had their attention drawn to the inconvenience and the extra expense to which residents and business people in the district are put by reason of the continued inferior illuminating and calorific power, purity, pressure, &c., of the gas supplied by the Gas Light and Coke Company, notwithstanding the greatly increased charges of the Company; and now that the necessity for the extraction from the gas of products valuable for the prosecution of the war no longer exists, they recommend that the attention of the Board of Trade be called to the matter, and the Board be asked to take early action for securing that the standards prescribed by Statute shall, without further delay, be complied with.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders to Alter or stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Saturday.

Wanted, For Sale, and Tender Advertisements, Six Lines and under (about 40 words) 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.		HALF-YEAR.		QUARTER.
United Kingdom	Advance Rate:	28/-	..	15/-	..	8/8
	Credit Rate:	32/-	..	16/-	..	9/6
Abroad (in the Postal Union) Payable in Advance		32/6	..	17/-	..	10/-

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

NOW READY. *Price, Bound in Cloth, 10s. 6d, Post Free in the United Kingdom.* **THIRTY-SIXTH YEAR.**

The Reports of Proceedings of the

DISTRICT ASSOCIATIONS of GAS MANAGERS for 1918

MOST OF THE PREVIOUS VOLUMES ARE STILL ON SALE PRICE 5s. 6d. EACH.

WALTER KING, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C. 2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

MEWBURN, ELLIS, AND PRYOR.
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70, Chancery Lane, London.
Telegrams: "Patent, London." 'Phone: 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

BENZOL PLANTS FOR GAS-WORKS.

BAGLEY, MILLS, & CO., Ltd., 92, Victoria Street, Westminster, S.W. 1, Invite inquiries from all Gas-Works making 75 million cubic feet and upwards per annum.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, p. 410.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"FERROX." "FERROX." "FERROX."

A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.
For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

H. & J. DEMPSTER, LTD., BLENHEIM ROAD, BROADWAY, WESTMINSTER, S.W. 1. MANCHESTER. PAT. ASH, DUST, BREEZE & COAL WASHER.

READ, WRIGHTSON, & CO., LD. SOLE MAKERS OF THE